THE
ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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ILLUMINATING ENGINEERING AND ELECTRICAL CONTRACTING.

THE keen competition between rival forms of illumination is developing a very critical and discriminating spirit among those who are responsible for installing electrical fittings and accessories. It was formerly considered sufficient if the electrolier or bracket was artistic, novel in design, and moderately cheap. The design of globe or shade was left entirely to the fancy of the artist, and within a very wide range the questions as to the total or partial frosting, the engraving or etching of patterns, &c., on the glass, did not very materially affect the sale of the shade. Quite recently, however, the illuminating engineer has spoken somewhat emphatically with regard to electric light fittings, and those who are in any way interested in the design and manufacture of shades, pendants, and brackets, may be advised to note very carefully what this new form of scientist has to say.

There is no doubt that the American illuminating engineer seems to be prepared to be militant in the enforcement of his opinions, as may be seen by a recent editorial in *The Illuminating Engineer* of New York. In that paper is written "The problem of 'butting in' of others, both professionals and laymen into the work of the illuminating engineer, is not always an easy one to solve, and until the profession has more firmly established its right to existence, it will require no small amount of tact, discretion and bulldog tenacity. The most serious interference is likely to come from the architect, who, besides being a jealous god, revels in the hallucination that he is an artist, and that all engineers are a menace to his 'art.' The electrical engineer, fixture manufacturer or decorator, may also have to be reckoned with. It may very well happen that the illuminating engineer may have to fight single-handed the whole combination, in which case the direction of the Englishman to his son, who was about to go away to school, may be metaphorically followed out, 'do not fight; but if you do fight, go in with your fists doubled up.'" There is every reason to believe that the illuminating engineer has come to stay, and that he is going to show the necessity for certain modifications of electric lighting fixtures. He will rule out pieces of apparatus from his specifications that do not satisfy his requirements, and the fixture manufacturer who is going to obtain his business will have to fall in with his requirements. Some of the things which it is thought may probably have to go, at a date not very far distant, will be the artistic atrocities which attempt to combine utilitarian illumination with a species of Germanic art.

Manufacturers of electric shades should very carefully study the distribution curves of various types of lamps as affected by the shape of the shades they employ, and it would probably be one of the finest advertisements in the present state of the science of illumination, if some firm

of shade manufacturers were to publish a series of curves of light intensities as affected by their shades, and send these to every station engineer and contractor in the kingdom. The success of the holophane reflector both in America and on this side of the water, has depended almost exclusively on the scientific setting forth of its properties of reflection, diffusion and concentration, which can be varied at will.

In regard to fittings, the average consumer will in future show a preference for those interior fittings which have the merit of portability, inasmuch as the flexibility of electric lighting will strongly be insisted upon, and for business purposes devices which exercise a directive effect upon the light suitable for various classes of shop fronts, while shielding the lights themselves, are already obtaining a good market owing to the growing appreciation of the fact that the shop window does not exist for a display of electric light, but to show off the goods.

There is no doubt that the science of illuminating engineering is going to open up a new field of commercial exploitation. Large manufactures are becoming standardised. Development in future will probably proceed on the successful study of the requirements of consumers in their multifarious needs. For this reason the manufacturers of electrical fittings and accessories will doubtless make it their business to keep a very close eye indeed upon the investigations of those who are studying light effects.

Niagara Falls Degraded.

It is many years now since the Niagara River was first called upon to pay tribute to modern industrial needs, and was, as the phrase goes, "harnessed" to an alternator, as though it were a horse harnessed to a whim. The draught of power is measured now by the million horse-power, but up to the present the majestic Falls have remained to all appearances unharmed, and nothing can be said against the wise and prudent use of the vast supply of energy thus reclaimed from Nature's stores.

We learn, however, from the American papers that the amenities of the Falls are endangered in another way altogether. The authorities of the city of Niagara Falls have commissioned the General Electric Co. to install batteries—we might call them parks—of large searchlights, with which to illuminate the Falls, and the work is actually in progress. Beams of all the colours of the rainbow are to be projected upon the falling waters, under the control of "an operator manipulating a keyboard" so as "to obtain a thoroughly artistic interpretation of the colour scheme"—*artistic!* To crown this scheme of vulgarisation, the Falls are to be assisted—faked—boosted—for their natural resources are inadequate to satisfy the doers of this vandalism. In fact, a steam boiler is to be used, to discharge "clouds of steam" from pipes "to augment the mists," so that "artistic" cloud effects may be produced, with the aid of the searchlights. Bombs will be thrown also, to burst over the Falls and emit heavy clouds of smoke or a shower of . . . . *confetti*.

Alas! How are the mighty fallen! The monster has been harnessed; now it shall be tortured, to make a Yankee holiday. Shame!

Small Heating Appliances.

The past year has been somewhat remarkable for the attention paid to the question of electric heating by manufacturers, and there is no doubt that, as was the case in America, the electric supply stations will find the addition of a heating load so beneficial to their diversity factor, that a considerable demand will be induced for the supply of electric heating devices.

There are indications that electric heating and cooking are to be reckoned with as a very considerable portion of the manufacturer's field of action, and one or two points to be remembered in the pushing of such sales may be worthy of consideration. In the first place, the error that was originally made in the sale of electric radiators—that of an attempted argument on their competitive price-for-price consumption with gas stoves—must not be repeated. The arguments that are used in the sale of radiators rest principally upon their portability, their cleanliness, their availability for immediate heat, and their safety as compared with other forms of heating apparatus. On this basis they are commanding a ready sale. In the same way, electric cooking and heating apparatus cannot in any way be compared with their predecessors, inasmuch as they are an entirely new scientific development. An electric iron, for example, is not a simple competitor with a flat-iron or box-iron. It is the means of a change in home life. Articles of delicate constitution which were formerly sent to a public laundry to be carelessly handled and spoilt can now be done at home by the lady of the house—a revolutionary feature as modern home life is now constituted. Electric cooking is not a thing which has to be instilled into the intelligence of the kitchen maid. The cooking is transferred from the regions below the back stairs to, perhaps, the actual dining table, with no loss of comfort and a considerable saving of worry, particularly in small households. It is this quality of distinct novelty as affecting household life that has to be insisted upon most strongly.

Again, electric heating should not be pushed by electrical manufacturers and agents solely through the electric trades. Provided that equitable prices are preserved, such goods can be handled quite well through ordinary ironmongers, and in this connection the arrangements made by certain of the metropolitan gas companies with such tradesmen, and the advantages accruing to both parties should be remembered. It must be realised that whereas the ordinary householder is only faintly interested in rival types of switchgear or cables, he is very much alive to the merits or demerits of any piece of apparatus which he himself handles, in order to directly satisfy his own needs. Electric cookers are to him of as much interest as mangles or mincing machines, or any other article which his better half forces upon his attention as being necessary for household functions. Hence, although switchgear must be left to electrical traders, electric cooking and heating apparatus can be sold in much more general ways. In a matter of this sort the manufacturer, the contractor, the sales agent and the electricity supply authority all stand to gain from the wider use of such articles. The wiring contractor should surely be intensely interested in a form of energy consumption, which, owing to the different tariffs usually existing in most supply areas for lighting and for heating, will involve separate circuits being run in every house, even though electrically lighted, for the purpose of heating. The sales agent will discover that electric heating goods do not involve a heavy capital outlay to handle, and if properly worked they produce a quick return on money spent, and the supply authority must know that if it is at all to compete with the strong position held by the gas concern in virtue of its gas cooking installations, it must use every means in its power to induce a heavy day-load due to electric heating. Electric heating accessories are a strong line for future development.

Opening of Extensions at the Technical College, Finsbury.—The evening courses at the Technical College, Finsbury, begin on September 30th, the advanced lectures in Electrotechnics this term being on the Design of Continuous-Current Dynamos (with special reference to steam turbine sets), by Prof. Silvanus Thompson. Other lectures will be given on the Designing and Laying Out of Distribution Systems, by Mr. H. H. Simmons. On Wednesday evenings during the autumn term Mr. R. P. Howgrave Graham will lecture on Electrical Instruments; and later there will be a special course by Prof. Thompson on The Permanent Magnet. The official opening of the new laboratories and drawing offices by the Lord Mayor will take place on October 2nd.

CORRESPONDENCE.

Letters received by us after **5 p.m. on Tuesday** *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Co-operation in the Electrical Trade.

On the whole, I beg to say I am not at all favourably impressed with the idea of encouraging any enterprise of such a description as establishing a permanent showroom or exhibition in London by various electrical manufacturers.

I do not think this would be conducive to keeping up prices, but, on the other hand, it would increase the competition and price-cutting, especially as many articles are practically identical—many manufacturers manufacturing the same article. I also doubt whether the general contractors would avail themselves of the opportunities offered. In many cases, too, I think it would diminish individual efforts and energy.

The suggestion may suit some manufacturers whose works and showrooms are situate in the country, in order to give them facilities for showing their manufactures in London, but I doubt whether London firms who have showrooms of their own would fall in with the views put forward. It would also become a cheap way of advertising for Continental manufacturers, to the detriment of English manufactured goods.

As the interests are so varied, I do not think that co-operation would be conducive to advantage to the whole of the participants and manufacturers generally.

G. Braulik.

London, E.C., *September 18th*, 1907.

I carefully read the article in your issue of the 13th inst., as co-operation always interests me, although, I must confess, somewhat academically.

My idea is that the movement is not feasible. It is so easy to put forth a word such as co-operation, or put it forth and surround it with a cataract of dialectic utterance, but the moment details come to be worked out and people approached with a view to joining in, the impossibility of organising anything tangible at once becomes obvious.

Every human being, be he Christian, Mohammedan, Jew or Negro, must intuitively know that the strongest law of nature is the "survival of the fittest," and in our trade it is a keen, but not unduly keen, fight for success; in other words, it is nature's battle over again. Naturally, some firms are on the "up grade," some on the "down grade," but both types think they are on the right lines, and are not going to brook interference from outside parties who are not pecuniarily responsible for the results. Proprietors or boards of directors cannot tie their hands in any way as to how their business shall be conducted, at what prices they shall sell, or what private information they shall agree to share with other parties at the dictation of a person or body of persons, who, as I say, will not be tangibly affected as to whether the outcome of such be successful or not; it stands to reason they will not.

Again, the electrical industry is altogether too large and of too diverse a character to be treated on co-operative lines. The various interests in it are too much at variance with one another. This has been found recently in the honest endeavour made to get motor makers to combine to keep their prices up and show a reasonable profit. Nearly all the firms agreed it was a good thing in theory, some agreed it could be worked in practice, whereas others said, "No, we welcome the competition, we have been preparing for it for years, and now is our chance when prices are keen, to go in and win." Who knows but that their views are right?

No: to attempt to apply the co-operative principle to the electrical industry, would be no more successful than putting a pair of corsets round a jelly-fish—the attempt is doomed from the start. Take the giants (by this I mean firms who go in for large machinery), their complaint is that when a competitive tender is called for, there is no saying what prices will be given in. Here, again, the survival of the fittest comes in. Take the supply houses; the trade goes to the one that is the best organised and equipped, and sells good articles at market prices. Take contractors; they are grumbling, and with just cause, that times are hard, but all the co-operation in the world will not prevent builders and contractors, and plumbers and ironmongers cutting in for the trade. Some of these burn their fingers and retire from the contest, others go on and succeed. Lastly, but far from least, take the fittings manufacturers; success with them largely depends on design and workmanship. How could they co-operate?

As to the substitution of a universal showroom in place of, or in addition to, the existing ones run by firms in London and elsewhere, this kind of thing has already been tried at the Soho Bazaar and such like places with disastrous results: it will never succeed and does not deserve to.

This letter may be thought merely "destructive criticism," but I belong to those who want to, and mean to, be left alone to succeed or fail by their own efforts, on top of which I am convinced that any attempt to treat the electrical industry on the lines of a "Glorified Goose Club" with its concomitant lunching and carousing is not desirable, is not practical, and is only put forward by parties who have everything to gain and not much to lose.

Another Manufacturer.

My attention has been drawn to an article in your paper on page 431 *re* Co-operation in Electrical Trade, and I should like to make a few remarks on the same.

Some months ago various manufacturers of dynamos and motors made a strenuous effort to regulate the prices of electrical machinery. They got out a most complete scheme for the working of this, which met with the unanimous approval of the members, yet three or four of the largest firms in the country definitely refused to come in, and the scheme, therefore, had to be abandoned. In view of this, and also of the fact that there are so many dynamo manufacturers in this country, it seems to be practically impossible to get a scheme together for a general regulation of prices.

As regards the Cable-Makers' Association, as all their products are practically alike, it is a very easy matter to regulate prices so as to prevent undue cutting.

I fail to see in what way the proposal by Mr. Northcote can be of any benefit to dynamo manufacturing firms. Practically all manufacturers make both dynamos and motors of sizes up to 50 KW. in such quantities that they could not produce them at lower prices, even if they were to put through still larger quantities.

I do not think that any large manufacturing firm would agree to let their business be managed in the way specified. Also, I think that practically all buyers would prefer to deal direct with the manufacturer.

My opinion is that English manufacturers will have to look after their business themselves, if they wish to produce a satisfactory balance-sheet.

The writer is, like most electrical machinery manufacturers, a believer in protection, but there is no doubt whatever that want of patriotism amongst British users of electrical machinery is responsible, to a great extent, for certain orders going abroad. Many Britishers prefer to buy in the cheapest market, and do not trouble to inquire whether the goods are made here or not. They often do not realise (as the Germans do) the importance of placing as many orders as possible in their own country. Every order placed in this country has a far-reaching effect, and will probably react to the advantage of trade generally and the purchaser individually.

Lancashire Dynamo and Motor Co., Ltd.
A. P. Wood, *General Manager.*

Manchester, *September 18th*, 1907.

Drawing-Office Lighting.

With regard to the correspondence on the above subject in this week's issue, I have taken particular interest in the correct lighting of drawing offices by means of arc lamps, from the point of view of greater efficiency, better results and improved supervision.

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Amongst the drawing offices within my knowledge where Union arc lamps are used, both of the inverted and indirect lighting system, I may mention the works of the following firms: Sir W. G. Armstrong, Whitworth & Co., Elswick; Western Electric Co., Woolwich; Messrs. Thornycroft and Co., Chiswick. These lamps have been in use for various periods of years, and have, so far as I am aware, given absolute satisfaction.

J. S. Plumtree,
Engineer of the Union Electric Co., Ltd.

London, S.E., *September 21st*, 1907.

THE FUTURE OF ELECTRIC HEATING.

For many years past the British public, or at any rate that small, though discerning, section who are users of electricity, have evinced comparatively little interest in matters appertaining to electric heating.

That this should have been so is only natural, when one takes into account the lethargic methods in vogue with most supply authorities; with the latter it has usually been a case of "take it or leave it" when supply tariffs have been questioned by the consumer, and one must admit that heating tariffs have not in the past been such as would lead to the general adoption of the radiator. Furthermore, the inflexibility of the usual tariff schedules has generally necessitated the installing of two meters and separate heating circuits—an unnecessarily expensive arrangement in the first instance—or the alternative of a supply at lighting rates—a still more prohibitive system in the long run, and has proved a most effective deterrent to would-be consumers of the heating class. If, in addition to this, we consider the tendency in the past of supply authorities to hide their light (heat in this instance) under a bushel, we shall conclude by congratulating ourselves that, in spite of all adverse circumstances, the electric heating business has continued to make progress.

With the object of showing what an extensive field still exists for the employment of electric heating devices of the domestic type, we have compiled, with the aid of a number of electricity works engineers, a few statistics regarding the present use of such apparatus, which, we believe, has received an impetus since reduced rates came into force in certain areas.

In recording these statistics, from which several important metropolitan areas are missing, one cannot help being struck by the indefinite returns given in many cases, from which one is bound to conclude that the supply authority either did not possess or could not easily turn up particulars of its consumers' installations.

One important London company, indeed, referred to the trouble of making such a return, hinting at a prolonged search through its consumers' accounts; other well-known supply authorities made no return at all.

In any case, one can only marvel that such a deplorable lack of knowledge of the doings of its customers on the part of a supply authority should exist in these days of card indexes and organised statistics.

A casual glance at the returns reveals the great disparity between the total number of consumers connected, and those using electric heating appliances; but the disparity is even greater than shown, for the total number of consumers has increased by from 10 to 20 per cent. since the figures in the first column were compiled.

On the other hand, it cannot be said that the heating rates, as given, are excessive in themselves, but evidently the initial cost to the consumer of providing duplicate wiring (for light and heat) is a great obstacle to the general use of heating apparatus.

The radiator (as a typical example of such apparatus) is an ideal substitute for a fire; it involves no preparation for or clearing up after use; it is absolutely cleanly, and can be moved about from room to room, if desired, and placed practically anywhere where an electric circuit exists; moreover, its heating effect can be regulated to a nicety.

Clearly its superiority over other forms of heater is such as should entitle it to general use among electricity consumers, and the fact that it cannot be used indiscriminately without additional wiring or meters, on the low rates of charge, must be held to account largely for the extremely inadequate recognition which it has received up to now.

Given a system by which the supply authority, either directly or, better, through local agents, would hire radiators and the like at a suitable minimum rental to the consumer, and allow the latter the privilege of using it on any circuit, making an allowance in his account for an estimated proportion of units at the cheap rate, we cannot help thinking that the radiator would go ahead as it is entitled to do, and that the supply authority would reap a material benefit in the way of a day load from the unrestricted adoption of such appliances.

Supply authority.	Number of consumers. Total connected.	No. using lighting and cooking apparatus.	No. of radiators connected.	Charge per unit.	Cost of gas per 1,000 cb. ft.
London.					s. d.
St. Marylebone ...	7,000	317	431	2d&1d m.d.	2 11
St. Pancras	(Heating and cooking consumers are not booked apart from power users, but are very few.)				
Battersea	—	47	76	1d.	2 3
Hackney	1,280	40	50	1½d.	2 11
Stepney	850	31	60	1d.	2 5
Fulham *	1,792	—	150 approx	1d.	2 11+ mtr. rnt.
Hampstead	5,714	322	900	1½d.	2 9
Hammersmith	1,856	52	90	1½d. less disc.	2 9
Woolwich	550	13	—	2d.-1½d.	2 3
Westminster E.S. Corp.	8,104	800	1,200	1d.	2 11
Metropolitan Elec. S. Co.	9,370	332	656	3d.-⅜d. m.d. or 2½d. flt.	—
Kensington & Knightsbridge E.L. Co.	3,957	211	450	1d.	2 11
Brompton and Kensington E.S. Co.	3,861	250	320	1d.	2 11
Notting Hill E.L. Co.	2,486	83	125	3d.-½d.	—
St. James' and Pall Mall E.L. Co.	2,315	185	446	1d.	2 11
Chelsea E.S. Co. ...	—	170	452	—	2 11
London E.S. Co. ...	(No return available.)				2 3
					2 11
City of Lond. E.S. Co.	(No return available.)				
County of Lond. E.S. Co.					
Charing Cross Co. ...					
Provincial.					
Sheffield	3,150	210	345	1d.	1 4
Edinburgh	9,355	332	700	1½d. with min. charge	2 9
Newcastle and District E.L. Co.	1,150	10	65	1½d.	1 10
Nottingham	3,194	141	205	1¼d.	2 6
Glasgow	13,705	140	300	1½d&⅜d md	2 4
Brighton	4,467	106	166	1½d. flt. or 1d. with T. switch	2 10
Manchester	6,340	292	505	—	2 3
Leeds	5,850	130	174	2d.	2 1
Liverpool	6,366	282	480	2d. to 1d.	2 6
Cardiff	1,332	49	89	1½d.	2 7

* Users on lighting supply at 3½d. per unit not separately booked.

An alternative method is to provide each radiator with a cheap recorder of some kind to enable its use to be gauged approximately, and this arrangement has obviously not received the attention it deserves.

The solution of the problem undoubtedly rests with the supply authority, which in recent times has, we are glad to say, shown a marked disposition to adapt its methods of business to the needs of the consumer, as opposed to the time-worn and useless system of trying to compel the consumer to conform with its ideas.

The supply authority can, if it will, initiate the movement: the manufacturer and retailer of the apparatus will gladly follow suit; these have practically everything to gain by pushing the business, which cannot be expected to be profitable when only isolated heating devices are installed.

Many engineers (doubtless of the "good old school") will shake their heads at such a departure from recognised methods, and to such we can only recommend a close study

of the ratio of their heating consumers to their total of consumers connected, and a due recognition of the business aptitude of the old woman with the apples, so ably enunciated by Mr. Chamen several years ago.

In our leading columns will be found a further reference to the possibility of pushing electric heating apparatus at the present time; the subject is also dealt with in the following article, and elsewhere in this issue.

ELECTRIC HEATING DEVICES.*

A report was made by Mr. Mathias E. Turner, of Cleveland, to the Ohio Electric Light Association Convention, August 21st, on "Electric Heating Devices," its scope being confined to electric heating appliances for household purposes. Mr. Turner considers that most electric heating devices are too slow in heating. What is needed is a higher temperature during the first few minutes, and if necessary to get it, to use more current for a shorter space of time. The second general criticism is that the methods used for attaching the appliances to the electric circuit must be improved. It is desirable that the attachment be a flexible cord, removable both from the heating appliance and the circuit, with a simple, durable plug for making the connection and disconnection to the heating appliance, which does not necessitate the burning of hands or the upsetting of the vessel's contents, and will not continually open or short-circuit. In the laundry, immersion coils are practical for boiling clothes in the clothes boiler, the chief objection to their use being the danger of severe shocks where the laundry floor is wet. Laundry irons of 6 lb. weight and single heat are, perhaps, best adapted to general household use. A switch mounted on the iron is a simple and effective improvement over the former method of heat regulation for ironing different materials.

Criticising electric cooking outfits, Mr. Turner limits himself to his own experience in catering for the wants of a number of purchasers of complete cooking sets. In these cases the type of outfit advised was an oak table with a slate switchboard at the back and an oak raised shelf at the side for the oven. The table legs were equipped with well adjusted castors. On the back of the switchboard was an asbestos-lined cabinet containing the fuses. In front, three base receptacles for single-heat appliances, and four three-point plug attachments, were set in flush with the slate. Above these connecting points were placed three snap switches indicating "off" and "on," and four three-heat snap switches indicating "off," "low," "medium," "high." Flexible cords, 18 in. long, were provided, having at the circuit-connecting end Hubbell plugs for single-heat cords and three-pronged plugs with handles for three-heat cords.

Manufacturers are developing two distinct types of cooking outfits: one in which the portable appliances are connected to a table similar to that described; and one in which stationary heating disks are designed much like the ordinary gas range, the only difference being that disks are used in place of flame burners. It may be that neither of these types is best. Possibly sectional shelves fitted with switches, connectors and disks, and capable of easy connection end to end or above and below each other, may offer a much more flexible method, adaptable to extension from a very small cooking outfit, as the need for a larger outfit arises in many families.

The electric oven with heaters top and bottom is a superior baker, but decidedly wasteful of heat. A chef proficient in electric cooking stated that it was the best baker he had ever used. But this one piece of apparatus wastes so much heat that through it electric cooking development is somewhat retarded. The oven should be very much better heat-insulated; it should be deeper; its door should be at the narrower end, and fitted practically air-tight when closed; it should be easy to clean; it should heat to a sufficiently high temperature in about 10 minutes and maintain a temperature suitable for most baking purposes for several hours, consuming not more than 250 watts—which it will do if properly constructed.

Hot water always available is requisite in all households. Until recently it has only been possible to obtain a sufficient quantity of hot water for washing purposes by means of immersion coils or similar devices which are bothersome to use, and this has made it necessary for would-be exclusive users of electricity to obtain hot water by other means. Lately there has been put on the market an instantaneous electric water heater. This device, together with all the other electrical heating appliances—more or less perfected—now enables one to specify in the house building plans (where one is permitted by prospective customers) special heating circuits and single-pipe water systems, for the exclusive use of electricity in all the duties usually performed by other illuminants and fuels, except winter interior heating, which one must still allow the furnace to do.

It is very necessary to the rapid development of electric cooking and heating, that these pioneer electric outfits give as little trouble as possible to the users of them.

Reliable data collected from 11 homes using complete cooking outfits are given in the accompanying table.

The tabulated number of families using electric cooking outfits exclusively is too small to draw any definite conclusions from, yet it would indicate that we might expect with the growth of this branch of the business an increased energy consumption of fro 100 to 200 kw.-hours per residence per month.

In Cleveland a two-rate meter method is used for residences. The result is that electric heating generally receives the benefit of the secondary or lower rate. In fact, the cooking in all the 11 residences cited was done at a 5-cent. rate. The expense under these conditions compares favourably with artificial gas.

Number.	Full months of use.	Average No. people cooked for.	Average kw.-hrs. used per month.	Average per month per person.	All or partly electric cooking.
1	11	7	237	*34	all
2	6	3	85	23	all
3	5	3	62	†21	all
4	2	7	171	24	all
5	1	3	34	11	partly
6	2	5	47	9	partly
7	2	7	68	10	partly
8	2	4	40	10	partly
9	4	6	34	6	partly
10	5	8	360	45	partly
11	1	9	71	8	partly
—	—	—	—	—	—
		20	555	28	all
		42	654	16	partly
		62	1,209	20	total

* Includes laundry ironing and water heating. † Includes laundry ironing.

To illustrate how popular electrical energy-consuming devices are becoming in the home, there were sold in Cleveland by the Illuminating Co., during the 12 months preceding last June, over 1,100 electrical devices. This was done through the efforts of one salesman, and newspaper advertising. There are now being sold over 100 such devices a month without the aid of any direct solicitation. In addition to this, supply dealers have been selling their quota in the city.

In the discussion on this report, Prof. F. C. Caldwell thought that the cost of cooking and heating devices for the kitchen must be reduced, as there is no place where there is a greater desire to economise than in kitchen appliances. Lagging, or heat insulation, is one of the things that ought to be improved. Here the amount of heat necessary to heat up the lagging is a serious matter. Where a heating device, like an oven, is started in the morning and kept at the same temperature for a length of time, that does not figure so prominently. He suggested that good results might be obtained by double-jacketing the oven and establishing a vacuum between the jackets, to be obtained by a small air-pump attached, with which a few strokes could be taken daily, sufficient to maintain the vacuum.

Mr. Martin reported 100 irons in use in a town of 700 customers. He estimated that for a family of six the iron was worth $1 a month to the central station. It was one of the best energy consumers the station had.

Mr. Plaice thought the manufacturer should provide a better cord, thus obviating present annoyance through repeated calls to make cord repairs. In connecting-up irons he did not allow the customer to put them on a general lighting circuit; he put in a special drop.

Mr. Rust said it was his company's practice to use a pendant switch with the iron and to instruct customers never to turn the iron off at the socket, but to use the pendant switch. He encouraged customers to use the iron in any room in the house.

* *Electrical World.*

TRAIN LIGHTING IN GERMANY.

The terrible railway disaster at Offenbach early in 1901, in which a number of persons lost their lives in consequence of the train being burnt by escaping gas ignited by gas jets or glowing coal or sparks from the locomotive, has recently been followed by a similar calamity on a smaller scale at Strausberg, where gas has again performed its deadly work of setting the train on fire. The latter event has raised the whole question of train lighting in Germany, and discussions of the problem are the order of the day in certain of the newspapers published in that country. After the Offenbach accident, the subject was discussed in the Lower Chamber of the Prussian Diet, when Herr von Thielen, the then Railway Minister, stated that a completely practicable system of electric lighting for trains did not exist, but that the authorities would certainly enter upon the work when such a method was available, and would provide the £2,500,000 which would be needed to effect the substitution of the electric light for gas. A little later in the year the question was discussed in the Imperial Parliament in connection with the railway budget, and the inquiry made by a committee of all the State railway authorities in Germany. The unanimous opinion of the committee was that in the then state of electrical engineering it was impossible for a great railway administration to convert the whole of its passenger coaches

to the electric system, but that experiments would be continued and fresh trials also undertaken. During the six years which have elapsed, very little work in this direction has taken place, and now we have, as has been said, the Strausberg disaster to bring forward the question forcibly again. After the Offenbach accident, tests were made on the Berlin-Stettin trains with steam turbo-dynamos arranged on the locomotives for affording a supply of light throughout the trains, but nothing is apparently known of the final results or even of the fate of the plant. The trains running between Berlin and Altona are electrically illuminated, as also are many of the so-called D trains from the east of Germany, but the aggregate amount of electric lighting is comparatively insignificant, and this accounts for the general outcry which is now proceeding against the use of compressed gas, and even against incandescent gas lighting, on the ground of danger to passengers. As a matter of fact, one of the carriages in the ill-fated train at Strausberg was electrically lighted by means of 11 glow lamps supplied from accumulators. This was the mail coach, which was almost wholly smashed up, but in contradistinction to the other carriages, no fire took place in it, and one of the lamps even continued to burn after the accident and facilitated the work of rescuing the postal officials from the van. One of the objections raised against electrically illuminated trains relates to the danger of short-circuits, and we actually observe the incredible statement made that cases have happened of passenger coaches being burnt out through short-circuits, but the assertion is carefully unsupported by particulars as to where, when, and under what circumstances such alleged occurrences have taken place. The fact is that gas lighting has obtained such a powerful hold upon the German railways that very little hope exists, notwithstanding the fresh inquiries that are being made on the subject, of any definite proposals being made for the general introduction of the electric light throughout the passenger trains in Germany, unless a repetition of the horrors of Offenbach in the near future should unfortunately occur, and perhaps force the railway authorities to deal with the question seriously. In view of the excellent systems which have been developed in this country, there is no excuse for their inaction.

SOME AMERICAN ELECTRIC POWER EXPERIENCES.

Before the National Electric Lighting Association Convention, held at Washington in June, a paper was read which, apart from its intrinsic value, was interesting from the fact that it was compiled and delivered by a lady. "Sarah M. Sheridan" is the name of the sales manager for the Detroit Edison Co., and this marks a phase of business-getting in connection with electricity companies which has, so far as we are aware, not been found in Great Britain. The quality of the paper and the value of the advice contained therein are a sufficient hint to borough engineers and others interested in increasing the load factor and output of their stations that if they want to shine as commercial exponents of electric power supply they will have to look to their laurels.

The authoress stated that in two years and four months the Detroit Co. added to its commercial power load 5,965 H.P. in alternating-current motors, 3,862 H.P. in direct-current motors, and, during the last 12 months, increased its day load 50 per cent.

The methods by which this energetic business-getting manager increased her sales of electricity may be summarised as follows:—First, motors were loaned and rented for trial installations. To do this it was necessary to carry a stock of motors during the year 1906 totalling a value of over £9,500, but the average monthly gain in motor connections was 450 H.P. The result of this progressive policy was that, as soon as local electrical contractors saw that the hire of electric motors was a profitable proposition, they put in motor stocks and adopted the company's plan of trial on loan for 30 or 60 days, running the motors for longer periods if purchase seemed likely in the future. This was done with the view of increasing their contracting business by handling the entire installations. Its value to the central station was that it gradually relieved the company of the necessity of carrying a stock of motors. After the trial period, the rental of the motor is fixed at 25 per cent. per annum on its net price.

The next feature on the programme of the company was to take care of emergency cases occurring in isolated plants due to fires or breakdowns, giving central station supply at a minimum rate. This practice very often led to the permanent connection of such customers to the company's mains.

Another feature which was well developed was supply to contractors on construction work. This class of business sometimes required extensions to the company's mains, but it was considered advisable to make these, because of the advertising value which it gave to electrical power supply among the contractors who were responsible for buildings of various kinds. Added to this, one would suppose that the mains would frequently be the commencement of a series of supplies to new districts.

A discriminating policy is adopted with regard to factory lighting. The company prefers to let short-hour factory lighting go to the gas authorities so long as it can get the power business, with the idea that by adopting this method it is certain that power business can be obtained, whereas if the evening lighting was also insisted upon the combined cost would be prohibitive. For this reason the company usually advises such customers to do their general floor lighting with "gas arcs," but to install individual incandescent lights at the machines. The company's rate system provides a high price per kilowatt-hour for lights used only a few hours annually, while the gas authorities make no difference between short-hour and long-hour consumers. All parties are satisfied by this division of services, and since the adoption of this policy the company has been relieved of the complaints regarding the lighting bills which were so frequent during the winter months, whereas formerly the lighting bills were sometimes as high as those for power.

Another feature in the company's campaign is a regular offer of a reduction on the standing-charge item of its price in consideration of a customer undertaking to refrain from using specified parts of his equipment during the hours of the winter lighting peak.

The company goes in for a considerable amount of consulting engineering work in connection with its customers' supply. For example, it takes special pains to assist customers in keeping down constant losses—such as friction and windage. One of the items upon which advice has been given and accepted to the benefit of the customer, has been the question of individual drive. The company has found that individual motors are not to be recommended, unless the saving in energy consumption is equal to 20 per cent. per annum on increased investment effected, except when individual drive is desired for special convenience, as a customer will doubtless earn as much on the same money invested in his business. In wood-working shops, individual motors displacing one large unit have shown considerable savings. For example, a 10-H.P. motor was replaced by nine motors aggregating 28 H.P., effecting a reduction of 20 per cent. in the customer's bills for the same work. Observations taken in one hundred factories at odd times show that on the average only 50 per cent. of the machines would be loaded up at any one time, because operators preparing work or adjusting machines are idle, or for the moment away from the machines. Further examples are as follows:—The company recommends consumers to use roller bearings on shafts in order to reduce the friction load; this is brought down some 20 to 25 per cent. as compared with good babbit bearings. Encouragement is also given to install shafts in separate short lengths where practicable in order to give advantage to the partial running of the shop. By changing tight cross belts to wide slack open belts on a shaft driving 20 machine pulleys, the power required was reduced by 3 H.P. In endeavouring to deliver the required power to a machine driven by a counter-shaft some 12-in. pulleys on the main and counter-shafts were changed to 24-in. pulleys, which reduced the load by 2 H.P. By reducing the speed in a line shaft in a large machine room from 220 to 190 R.P.M., a saving of 8 H.P. was effected without decreasing the output, as the speed of the pulleys was provided for by speed cones. In a polishing room having 10 double heads in a row, with one exhaust fan at each end of the machine, the machines were rearranged in two rows and one fan placed between the rows, effecting a saving of 8 H.P. The company, owing to experience with its customers, obtained a good deal of special knowledge with regard to fans, blowers, air-compressors and centrifugal pumps. The power required by these machines varies so much with variations of speed that every such machine in a consumer's installation is examined to see whether it is being over-speeded; to run blowers needlessly fast is a common fault. In displacing a steam-driven blowing installation it was found that 2 oz. less pressure was sufficient for the work, and by reducing the speed of the fan the customer was saved about 26s. 6d. per month, bringing the cost of electrical power low enough to compete successfully with steam. Other cases were the reduction of the pressure on the blower by 1 oz. by moving the fan 100 ft. along the length of pipe, reducing the load by 6 H.P.; 4 H.P. was saved by straightening several sharp curves on the blower pipe; in a small shop friction loss was reduced by changing the position of the piping of an air-compressor, so that an intermittent small loss in the air pipe was substituted for a constant considerable loss on friction in a shaft; in the same place a portable desk fan playing on cooling tanks was substituted for a wooden blade fan revolving at the end of a line shaft. The last two changes alone brought down the energy consumption by 15 per cent.

A motor replacing a gas engine driving automatic machines increased the output of the machines 10 per cent., owing to the fact that the constant turning moment permitted a heavier feed to be given to the cutting tools. In other cases it was found that the cutting speeds could be increased to a point higher than was possible with the unsteady gas engine drive.

That it is necessary to keep constant supervision over a customer's installation is shown by one case in a small factory where the energy consumption came out 25 per cent. higher than the company's estimate. In spite of the factory superintendent's assertion that the machines were in excellent condition, the company finally prevailed upon the manager of the company concerned to allow it to test all his machines. After two days' work it was discovered that the journals of the air-compressor were running on the iron of the boxes. After babbitting the bearings, the customer's demand was reduced by 2 KW. and the business retained. In a shop turning out steel products, the company was asked to install

a 50-H.P. motor for three months only, to serve part of the plant while the boilers were being rebuilt. This gave an opening for consulting engineering, and before the three months were up the company made the following recommendations, which were not exactly electrical engineering, but which brought about a permanent shop installation of motors of 150 H.P. with a monthly energy bill of £52: motor-driven air-compressor to be installed, supplying air instead of steam to oil burners in forges, the change saving the cost of power by economy of oil; the work to be arranged so that the big grindstones were operated off the peak, making the medium service rate available for this plant; to do the work requiring high-pressure steam two days a week instead of each day, reducing the stand-by charges for steam and dispensing with one man; to install a governor for the air-compressor, to close the inlet valve, allowing the compressor to run light until the tank pressure fell to the supply pressure; and to cut out useless shafting. These economies reduced the operating cost to the shop by electricity below its former steam costs.

This *résumé* of the work of the Detroit Edison Co. is very suggestive of the way in which electricity supply can be made of direct interest to the consumer. It illustrates once again the motto which should be borne in mind by every business-getting manager: "Don't talk to the customer about watts and amperes, but talk pounds, shillings and pence."

BUSINESS NOTES.

Catalogues, Lists, &c.—THE KEY ENGINEERING CO., LTD., 4, Queen Victoria Street, E.C.—Influenced, they say, by our suggestions that English manufacturers who cater for foreign business should print their publications in the language and coinage of the countries concerned, the Key Engineering Co. have had their "Fibre Conduit Picture Book" printed in three languages, French and German being interleaved with the English text. The result is admirable. Apart from the excellent illustrations, which at the same time exemplify the valuable qualities of fibre conduits and reveal the vogue which they have already acquired, the descriptive matter is clear and terse, and the lessons conveyed by the illustrations are driven home with simple brevity. The fibre ducts we have already described; their advantages in point of cheapness, lightness, ease of laying, security against electrolysis, durability, &c., could hardly be more convincingly explained than by this veritable "Picture" book.

MESSRS. G. R. OUSEY & Co., of 7, Bunhill Row, London, E.C., are supplying flexible arm electric desk lamps, concerning which they have issued an illustrated priced leaflet.

MESSRS. ARCHIBALD SMITH & STEVENS, of Janus Works, Queen's Road, Battersea, S.W., in their catalogue of electric lifts (36 pages) give information relating to results of working with lifts, and illustrate the equipments necessary for operating their lifts for goods and passenger service. Methods of driving—direct coupling and belt and countershaft—are discussed, also systems of control, and the chief points of their patent controller are mentioned. A list of testimonials from users brings up to the rear. Two machines supplied for the Great Central Railway Co. appear among the illustrations, also some complete passenger lifts with art ironwork and polished hardwood cage respectively.

MESSRS. W. & R. JACOBS, 39c, King William Street, E.C.—Leaflet showing, and stating prices of, their "Electary" accumulators. The cells are British made throughout, and are fitted with strongly constructed plates, made specially to stand hard wear and rough usage. Incorrodible terminals are provided, and there is a neat form of anti-splash vent. The cells are made in all sizes (2, 4 and 6 volts), the smallest being a little 6-ampere cell suitable as a spare for a motor cycle, whilst the largest runs up to 80 amperes for car work.

MESSRS. INIGO JONES & Co., Tudor Slate Works, Groeslon, R.S.O., North Wales, have issued a new price list of plain and enamelled slate for switchboards and bases, and other electrical purposes. All manner of slates required by electrical engineers are included—slabs, disks, slates plain and enamelled—prices and sizes being arranged in tabulated form. The firm enamels slates in imitation of all kinds of marble or wood. The slate is specially selected for electrical purposes, and is claimed to be free from metallic impurities and easily drilled.

MESSRS. DOBBIE, MCINNES, LTD., 45, Bothwell Street, Glasgow.—A number of illustrated catalogues have come to hand. One contains a full account of the "McInnes-Dobbie" indicators—automatic diagram recording indicators and other testing instruments and specialities for steam and gas engines. A second describes their Mathot continuous explosion and pressure recorders for motors and gas and oil engines. A third deals with the Cipollina continuous double diagram indicator with speed and time recorder. Other lists deal with their patent pocket pitchometer, "Sellers" portable dynamometer, and the "Britannia" speedometer.

THE BRITISH ELECTRIC PLANT CO., LTD., Alloa.—16-page catalogue containing full descriptive particulars also tabulated sizes, outputs, weights, prices, &c., of their standard B.E.P. three-phase induction motors of the squirrel cage type with short-circuited rotors; also of their three-phase generators. Among the half-tone views is one showing a 180-K.V.A. three-phase generator arranged for direct-coupled exciter, a 300-B.H.P. vertical type three-phase motor driving a sinking pump in a copper mine, and a photograph illustrating the company's works and the bulk electricity supply station.

MESSRS. TETLEY & Co., Falcon Works, Bedford Street, Greengate, Salford.—Illustrated catalogue (40 pp.) of their various electrical specialities and switchgear. These include several types of knife and main switches, oil-break enclosed mining switches, switchboards, including a standard type for textile motor control, automatic electrical time switches, remote control switch, high voltage thumb switches, Falcon fuses, Lyons electric heaters, electric resistance bricks, electric fans, &c. Increased business has necessitated the removal of the firm to larger premises at the above address, where the actual manufacture of these and other lines is proceeding. The firm claims to have carried out some of the largest installations in the country of switch and controlling gear for the electric driving of textile machinery.

THE HELIS CELL & ACCUMULATOR CO., LTD., 53 and 54, Chancery Lane, W.C., have issued a leaflet setting out the advantages claimed for the Helis electric dry cell (Szek's patent), together with extracts from a report thereon by the National Physical Laboratory.

THE PERFECTA SEAMLESS STEEL TUBE AND CONDUIT CO., LTD., Plume Street, Birmingham.—A 24-page booklet just issued by the company contains fully illustrated particulars of a light adaptable box and the various uses to which it can be put. It is strong, and is suitable for use either as a junction box or an inspection box, or it can be mounted with switches, ceiling roses and fuses, and is also applicable for horizontal pendant fittings. In combination with standard accessories as above, it is claimed that the box is very cheap.

MESSRS. J. C. LYELL & Co., LTD., 55, Victoria Street, London, S.W.—A number of leaflets are received as follows: One relating to their "Firefly" lamps for high and low voltage, a number of motor-car users' lamps and accessories being also included; a list describing the "Zulu" change-over ignition switch; also a leaflet dealing with the "M S" (maximum save) electric lamps for automobiles, medical and dental purposes, &c. Prices are quoted in the lists.

MESSRS. FIELDING & PLATT, LTD., Gloucester.—Illustrated catalogue of their gas engines and suction gas producers. Some fine views and a specification of the "Fielding" gas engine appear. One of the pictures shows a 180-B.H.P. four-cylinder vertical gas engine, direct connected to dynamo. Those interested in suction gas might find the catalogue useful.

MESSRS. D. SANTONI & Co. (1906), LTD., Beauchamp Street, Holborn, E.C.—New price list of small power motors, also a combined set for grinding, polishing, &c.

THE LIGHT ELECTRIC MOTOR CO., LTD., Seven Kings Electric Works, Meads Lane, Seven Kings, Essex.—Illustrated eight-page catalogue of their patent portable electric drilling machines.

THE UNION ELECTRIC CO., LTD., Park Street, Southwark, S.E.—An interesting folding publication, about the size of four REVIEW pages, giving on one side photographs of examples of street lighting in different places by means of "Excello" arc lamps, while on the other are a few things writ by him of Stratford-on-Avon, arranged under the title of "Excellent Words from an Eminent Source," so that their initial letters make words testifying to the quality and finish of these lamps.

MESSRS. ELLIOTT BROTHERS, Century Works, Lewisham, S.E.—Pamphlet D.C. 57, relating to the Groves patent mains ohm-meter, for testing the insulation of mains without interrupting the supply.

Trade Announcements.—MESSRS. THOMAS R. MARTIN & Co., LTD., manufacturing electrical engineers and merchants, whose head office is situated at 77, High Bridge, Newcastle-on-Tyne, with branch offices in London and Middlesbrough, are now acting as sole agents for Great Britain for Küppers Metallwerke G.m.b.H. of Bonna Rhein, and they can deliver "Tinol" soldering paste from stock.

We understand that MESSRS. COOPER & CLEGG, LTD., of 34, Pall Mall, Manchester, who five months ago purchased the business of Wright, Methuen & Co., Ltd., at the above address, have now purchased the goodwill and stock of H. S. Wood & Co., of 3, Clarence Street, Manchester, and have transferred it to their premises.

MR. J. BOWEN, who was for 11 years with Hill's Plymouth Co., has commenced business as an electrical engineer at 30, Victoria Street, Merthyr Tydfil.

MESSRS. CARSON & EVANS, 3, Fenchurch Buildings, E.C., are specialising in the protection of all dangerous metal parts in stations, by a thick covering of special quality ebonite. At the present moment they are carrying out installations of bus-bars for two large power stations.

MESSRS. BRECKNELL, MUNRO & ROGERS, LTD., of Bristol, are opening new offices in London at Finsbury Pavement House, E.C., on 27th inst., under the management of Mr. E. M. Munro, M.I.Mech.E., M.I.E.E.

On 28th inst. MESSRS. F. W. SMITH Co. are removing from their present Salford address to larger premises at 12, Tib Lane, Cross Street, Manchester.

Book Notices.—"Proceedings of the 40th Annual Convention. American Institute of Architects, 1906. Washington: The Institute. 1907.

Gas Works Directory and Statistics, 1907-8. London: Hazell, Watson & Viney. Price 10s. 6d. net.

"Electrical Engineering." By Dr. Thomälen. Translated by G. W. O. Howe. London: E. Arnold. Price 15s. net.

"Transactions of the Institution of Civil Engineers of Ireland." 72nd and 73rd Sessions, November, 1905, to May, 1907. Vol. 32. Dublin: J. Falconer.

University of London. University College Calendar, Session 1907-1908. London: Taylor & Francis.

"Steam Boilers." By W. H. Fowler. Manchester: Scientific Publishing Co. 1907. Price 12s. 6d. net.

Phœnix Contracts.—Among orders recently received by the Phœnix Dynamo Manufacturing Co., of Bradford, are the following:—

For the Grimsby Corporation electricity works, to the specification of Mr. W. A. Vignoles, a 500-kw. "P. D. M." generator, coupled to a Belliss & Morcom engine.

For the Wednesbury Corporation, battery booster and feeder booster sets and switchgear to the specification of Mr. W. Fennell.

Messrs. Levinstein, Ltd., Manchester, to the specification of Mr. William Cramp, all the variable speed motors for the electrification of the Crumpsall Vale works.

For a large mill in Cleckheaton, 100-kw. generator at 100 r.p.m., motors and switchboards, &c.

For a large mill in Dewsbury 100-kw. generator, motors and switchboard.

100-kw. dynamo with Belliss engine and large switchboard for the Old Roundwood Colliery.

Messrs. Brown Bayley's Steel Works, Sheffield, 110-kw. dynamo, with Allen engine.

For Messrs. Kohler Bros., in connection with their printing press equipment for the London *Daily Mail*, six 60 and six 10-b.h.p. motors.

For the Great Western Railway Co., Swindon, further order for variable speed motors.

For the Hammersmith Borough Council, small motor-generator set.

For the Manchester Technical School, the South-Western Polytechnic, and the Brighton Technical School, various machines for laboratory and demonstration purposes.

For the Greenock electricity works, to the order of the Horsfall Destructor Co., seven totally enclosed motors.

For various other textile mills, works, &c., in the Bradford district, some 400 b.h.p. of motors.

Loughborough Exhibition.—Following the note on page 463 of our last issue, we are informed that at this exhibition there also exhibited outside the building four Excello arc lamps of the Union Electric Co.'s supply, while inside there are some of the same company's new pattern "Kohinoor" arc lamps. The Union Co. state that the Snowball Excello arc lamp burns pure carbons, gives no ash, and gives a spectrum exactly similar to that of daylight. It has been in use for practical purposes for nearly three years.

More American Electrical Works for Manchester ?! We publish the following paragraph with the utmost reserve:—"A trade correspondent learns from unofficial, but generally reliable sources, that two American firms of electrical engineers are now casting about for sites on which to establish works in the vicinity of Manchester. This invasion is being kept quiet, and no definite choice of a site has, as yet, been made."

West Ham.—The Corporation has accepted the offer of Crompton & Co. to purchase, at £220, a set of condensers.

G.E.C. Dry Cells.—The General Electric Co., Ltd., of 71, Queen Victoria Street, E.C., ask us to announce that the G.E.C. dry cells are now made at their Witton Carbon Works. Large stocks are held in London and the Provinces.

An American Infringement Suit.—We are informed by the Westinghouse Companies' Publishing Department that the United States Circuit Court for the District of New Jersey have just filed an opinion in the suit of the Westinghouse Electric and Manufacturing Co., Pittsburg, against the Prudential Insurance Co., of America, charging the latter with the infringement of the Nolan Patent No. 582,481, in the generator manufactured by the Bullock Electric Manufacturing Co., of Cincinnati, O. The Nolan patent relates to a simple means of fastening together the laminæ of the cores of electrical machines, and to the casting by which they are supported, and whereby the armature can be readily taken apart and put together. The laminæ are clamped between a cylindrical flange at one end of the casting, and a ring fitting over the other end of the casting. This ring is held in place by a small fastening ring interposed between it and a small shoulder on the casting. A shoulder is provided upon the outer face of the clamping ring for preventing the small ring from flying outward. This is generally termed the spring-ring method of clamping armature laminæ. Judge Lanning held that claims 2 and 4 of the Nolan patent were valid and covered the construction found in the Bullock generator used by the Prudential Co., the construction being a substantial copy of that shown in the Nolan patent and that used by the Westinghouse Co.

Philips's Lamps.—The "Philips" lamps are claimed to have obtained favour throughout the United Kingdom and the Colonies on account of their reliability, and by the makers having made special endeavours in the way of attractive and neatly-finished bulbs and brass vitrite caps to meet the requirements of English customers. We understand that the sales of the "Philips" lamps in the United Kingdom and Colonies are very large. Messrs. Philips & Co., of Eindhoven, Holland, are also specialists in fancy flame, globular, tubular lamps, &c., and in radiator and Snowilite lamps. As regards delivery, they carry heavy stocks, and there is a daily and well-organised service of fast steamers which connect Holland with the various ports of Great Britain and Ireland in connection with inland railway through services.

Robertson Fire Brigade.—In the annual competition for the City Fire Shield, presented by the Corporation of London, held at the Guildhall on Saturday, the Robertson Fire Brigade lost possession of this shield. Twenty brigades competed, and the Robertson Brigade were placed third, only one or two seconds dividing the first three brigades. In the competition for the Fire Brigade Championship, the Robertson Brigade hold a clear lead of 12 seconds, and in the concluding event, which is to take place on October 19th, it is anticipated that the Robertson Brigade will still retain the championship.

Dissolutions and Liquidations.—City of Wellington Electric Light and Power Co., Ltd.—This company is winding up voluntarily, with Mr. H. E. Salt as liquidator.

Severn Electric Launch Co., Ltd.—A meeting is to be held at Stourport, on October 21st, to hear an account of the winding up from the liquidator, Mr. W. F. Whittaker.

W. Mackie & Co., electrical engineers, 122 and 124, Golden Lane, London.—Messrs. W. Mackie, E. J. Glyn and A. R. M. Lockwood have dissolved partnership. Mr. Glyn will attend to debts, &c.

Wood & Crawford, mechanical and electrical engineers, Alma Works, Alma Street, Sheffield.—Messrs. W. J. Crawford and E. Draper have dissolved partnership. Mr. Crawford attends to debts.

McPhail & Simpson's Dry Steam Patents Co., Ltd.—A second dividend of 1s. 8d. in the £ is payable on October 2nd, by Mr. J. W. Close, North British and Mercantile Buildings, East Parade, Leeds.

A.E.G. Metallic Filament Lamps.—The Electrical Co., Ltd., of 121-125, Charing Cross Road, W.C., inform us that their works have now introduced an entirely new metallic filament lamp, giving 50 to 60 c.p. on circuits of 100 to 130 volts, with an efficiency of 1 watt per candle. They are not recommended for burning in series for the present; parallel running only is strongly advised. The average life is 800 to 1,000 hours, with practically no depreciation in candle-power during the whole of this period; the size and shape are similar to those of an ordinary 32-c.p. carbon lamp. The company are prepared to deliver, free, small parcels containing 10 lamps for trial purposes, in the first instance only. They have a considerable stock at their London and Manchester houses.

Petrol-Electric Sets.—Messrs. R. J. Nicholson and Co., of Macdonald's Lane, Corporation Street, Manchester, have issued a great deal of publicity literature for the purpose of keeping their "Junior" ideal electrical outfit—petrol-electric sets—before the notice of contractors, architects and others who have to do with country house and other such installation work. A leaflet, issued to the trade only, gives special net prices for the 1907 lighting season.

Co-operation in the Electrical Trade.—With reference to the letter by "J. A. K." appearing in our last issue, the Electrical Press, Ltd., write:—"In the list of advertising literature given by "J. A. K." under the above heading (Electrical Review, September 20th, p. 461), it is stated *Electrics* is published by the Society of Power Company Officials. *Electrics* is, however, published by the Electrical Press, Ltd.; it is the official organ of the Society of Power Company Officials, but is also the publicity medium of about 30 electricity supply undertakings. Thus it provides an example of the centralised or co-operative publicity which your correspondent advocates. We are closely in touch with the market for electrical advertising literature, and we are surprised to read 'J. A. K.'s' opinion that 'there is a large demand for semi-technical and technical literature for various purposes.' Our experience is that central station engineers generally recognise that they are dealing with people with no technical knowledge; consequently the demand is for literature in which the technical element, even in the case of electric power applications, is reduced to a minimum."

Hagen Accumulators.—We are informed by the Hagen Accumulator Works, of 39, Snow Hill, E.C., that their traction batteries, types W and L, are used by the electric cab companies of Buenos Ayres, Berlin, Frankfort, Cologne, Milan and Vienna, and a good many are in use in this country. Type W gives with 150 discharges 20 watt-hours per kg. of gross weight, and type L 34 watt-hours. In all they have supplied about 1,400 traction batteries, and 4,800 stationary batteries.

LIGHTING and POWER NOTES.

Croydon.—At the B.C. meeting on Monday evening, the Lighting and Electricity Committee drew attention to the present mode of charging for electricity for power purposes, viz., the time-switch system, which was inaugurated in October, 1904. At that time there were but few motors connected with the electric mains. From the experience now gained with this system of charging, and with a view of obtaining further consumers, the Committee recommended upon the suggestion of the engineer (Mr. A. C. Cramb) that the charge for energy for motive power purposes, on the time-switch system, should be as follows:—1½d. per unit for all times except between dusk and 11 p.m.; 3d. per unit for all energy consumed between dusk and 11 p.m. (the latter charge at present is 5d. per unit). This recommendation was agreed to without discussion. The Committee also considered the question of lighting factories. Under the present arrangements, it is necessary for such premises to be wired in duplicate, with duplicate meters for lighting and power purposes. With a view to removing the objections of owners of factories and workshops, the Committee recommended that electricity used for lighting purposes be charged

through the same meters as the motors where the time-switch system is in vogue, provided that the quantity used for lighting does not exceed 20 per cent. of the total amount of energy taken. By this arrangement one set of wiring only would be needed, and the Committee would be saved a considerable amount of capital outlay in the purchase of meters. This proposal was also adopted.

Dublin.—A new company has been registered here for the supply of electrical energy in Dublin, and the counties of Kildare, King's and Queen's.

Dundalk.—The Urban Council is considering an electric lighting scheme which may cost anything between £10,000 and £15,000.

Ilford.—The U.D.C. has applied to the B. of T. for permission to use overhead wires for the purpose of public lighting in the outlying portions of the district.

Kettering.—A L.G.B. inquiry was held on September 18th into the application of the U.D.C. for a loan of £3,500 for electricity purposes. There was no opposition.

Long Eaton.—The U.D.C. has applied to the L.G.B. for a loan of £10,000 for the extension of the electricity works.

Sedgefield.—The B. of G. is considering the advisability of having the E.L. installed at the workhouse. It is proposed to take energy from the County Asylum close by.

South Africa.—Uitenhage (Cape Colony).—At a special meeting of the Town Council, held on August 29th, the offer of Messrs. W. Bellad, Ellis & Co., of Port Elizabeth, to lay down at their own cost an electric light plant and to light the streets for £825 per annum, was accepted, the Council reserving the right to purchase at a future date; private consumers are to be supplied at a fixed rate. The scheme is to be submitted to the ratepayers at a public meeting.

Victoria Falls.—The Victoria Falls Power Co., Ltd., has received advices that the electrical power stations at Germiston and Brakpan, on the Rand, purchased respectively from the General Electric Power Co., Ltd., and Rand Central Electric Works, Ltd., are now supplying power to their utmost capacity. It has been found necessary to enlarge the capacity of the Germiston station pending the erection of the new central generating station of 24,000 H.P. capacity, the machinery for which is stated to be in an advanced stage of construction.

Whiteabbey.—The Belfast P.L.G. Board is considering a scheme for the electric lighting, &c., of the Abbey and its grounds, Whiteabbey. The estimated cost is £3,410, and this is considered too high.

Wisbech.—The T.C. has sealed an agreement transferring the E.L. order to the Wisbech E.L. and Power Co. The company undertakes to have the installation complete within six months of the date of the transfer.

TRAMWAY and RAILWAY NOTES.

Accrington.—After the Tramway Committee had made a final inspection of the new section of the electric tramways from the market ground, on September 20th, the length was opened for traffic. The line runs halfway to Clayton-le-Moors.

Argentine.—The *Review of the River Plate* recently recorded the 39th anniversary of the opening of tramways in the Argentine. In the course of its remarks, the above paper refers to the prejudice against the introduction of the horse tramcars into Buenos Ayres, where "as a sop to public opinion, the cars were preceded by a man on horseback, blowing a horn, so as to warn pedestrians of the approach of the deadly monster." On June 30th, 1907, there were 524 km. of horse and electric line in the capital, carrying some 20 million passengers in the month. Important new sections are under construction in many parts of the city and suburbs, notably by the Port and City Tramways Co. and the Southern Suburbs Tramway Co.

Bradford.—The Tramways Committee has recommended the T.C. to apply for a loan of £40,000 for the extension of the tramways in the city.

Continental Notes.—Germany.—It is announced that the Allgemeine Elektricitäts Gesellschaft has now entered the arena in competition with other promoters of high level, underground, and suspended electric railways for the German capital. The company has, in fact, forwarded to the police presidency a general scheme for the establishment of an electrically-operated underground railway between Gesundbrunnen and Rixdorf, the construction of which is estimated to cost £5,000,000. The scheme provides for a high-speed railway which would, for the greater part, be built as a shallow underground line, and as an elevated railway for the remainder of the distance in the outer portions of the city. It is of importance to note that the project relates materially to the use of the subsoil of the same streets as would be traversed by the long-projected suspended railway between Gesundbrunnen and Rixdorf. The railway would begin at the Gesundbrunnen railway station, be led under the Brunnen and Invaliden Strassen, cross under the River Spree in the vicinity of the Jannowitz Bridge, and thence be led, as in the case of the suspended railway, through the south-east of Berlin to the Hermannsplatz at Rixdorf, whilst the suspended line would continue further to the Hermann Strasse. It is calculated that the underground railway would cost, at the total of £5,000,000 previously mentioned, three times the probable expenditure on the suspended railway. The Elevated and Underground Electric Railway Co. has informed the Municipal Highways Committee that it proposes to devote attention to a scheme for the construction of a closed network of railways for Berlin.

Italy.—La Société Belge de Tramways Electriques, Eclairage et Force is the name of a new company which has just been formed in Brussels with a capital of £50,000, to acquire and work the tramway system in the town of Ancona, Italy.

Croydon.—The L.G.B. has written sanctioning the scheme for the reconstruction of the railway bridge in Penge Road, South Norwood, necessitated by the opening of the tramways, and to which a portion of the cost is contributed by the late lessees of the Croydon system, the B.E.T. Co.

Glasgow.—At a meeting of the Tramways Committee it was reported that the Corporation had adopted the following resolution:—"That the Corporation, being satisfied that economy and efficiency are sacrificed through the production of electrical energy being entrusted to two departments, resolves that the entire production, both for power and light, be put under one control, and that it be remitted to the Tramways and Electricity Committees to confer and report how this could best be done." The Committee agreed to remit the matter, so far as affecting the Tramways Department, to the Sub-Committee on Works and Stores for consideration and report.

London.—Lambeth.—The B.C. has approved of provisional plans submitted by the L.C.C. of the proposed tramways from West Norwood to the Crystal Palace. Negotiations are proceeding between the Borough Council and the L.C.C. with regard to the proposed widening of South Lambeth Road in connection with the tramways.

Manchester.—It is stated that the tramway employés of Manchester and Salford Corporations intend to bring certain grievances before the candidates at the coming municipal elections. Their chief desire is to impress on the public the necessity for a lower speed limit. They complain that their scheduled time is so narrowly cut now that they are often compelled to travel at a speed which is not conducive to public safety. The speed limit should be established by the B. of T., they contend, as well as the adoption of a uniform and effective brake.

Rio de Janeiro.—The British Empire Trust, Ltd., London agent of the Rio de Janeiro Tramway, Light and Power Co., Ltd., has announced that the Municipal Council of Rio has formerly approved and ratified the contract for the unification of the tramways and has settled all outstanding matters definitely. The company has obtained all that it desired, including extensions of the period of the concessions, moderate taxes, fixed the entire period and many valuable facilities for operating the company; it also has secured the right to build extensions in suburbs with monopoly within the zones similar to present lines.

West Bromwich.—The local branch of the Independent Labour Party recently sent letters to the Local Government Board and the Board of Trade asking them to intervene and hold an inquiry into the tramway difficulty which has arisen respecting the lease of the lines. Accompanying the letters was a copy of the resolution passed by the burgesses at a meeting on June 20th, pressing for an inquiry, and also a copy of the proceedings of the Town Council on the question. The Board of Trade has now replied that it does not appear to have power to intervene. It states that the consent of the department to the lease of the tramways was not required, and the lease, accordingly, was not submitted for the approval of the Board. The Board states further that the matter does not appear to be one in regard to which it is in a position to hold an inquiry.

West Ham.—The Tramways Committee, reporting with regard to the decision of the L.C.C. to electrify the lines between Bow Bridge and Commercial Road on the "G. B." contact system, points out that this would be a most serious obstacle in the way of through-running over this portion of the London system and the extra Metropolitan tramway systems, and expresses the opinion that both the L.C.C. and the Stepney B.C., in approving of the "G. B." system, could not have been aware of the serious inconvenience which would be caused to the travelling public if through running could not be arranged. The Committee instructed the town clerk to lay its views before the L.C.C. and the Stepney B.C., and also to communicate with the adjoining local authorities on the matter. It had further directed the town clerk to bring the subject before the attention of the B. of T., and explain the difficulties which are likely to be created both from a public standpoint and in the interests of the authorities owning tramway systems, in the event of any action being taken which will render difficult any through-running arrangements.

TELEGRAPH and TELEPHONE NOTES.

Australia.—A second telephone trunk line is to be constructed between Sydney and Katoomba, and tenders for the work are to be called for at once.

Egypt.—A new telegraphic connection between Constantinople and Cairo is reported to have been opened for traffic on September 1st. By means of this connection it is now possible to telegraph in direct traffic from Cairo to London *vid* Constantinople and Buda-Pesth. Hughes apparatus is used on the section between Constantinople and Beyrout, and duplex apparatus between Beyrout and Cairo. The construction of the line has involved an expenditure of £16,000, and the works have occupied a period of eight months. The charge for telegrams from Egypt to Constantinople has been fixed at 1 fr. 10 centimes per word.

South Africa.—Telephonic communication has been established between the Colonies of Natal and Transvaal, the line being put into use between Durban and Pretoria on September 1st. The charges for a three-minute conversation with Johannesburg are as follows:—From Pietermaritzburg, 5s. 3d.; Durban, 6s.; Ladysmith, 4s. 3d.; and other towns in proportion to their distance. Exchanges are established also at Boksburg, Germiston, Krugersdorp and Roodepoort, and public call offices are also established at Heidelburg, Nigel, Standerton, Volksrust and Vereeniging. This intercommunication supplies a long-felt want between the two Colonies, and it is hoped that trunk lines from the other Colonies will shortly be constructed.

Telegraphic Interruptions and Repairs:—

Cables.	Interrupted.	Repaired.
Curacao-Coro Curacao-La Guayra } Closed.. Curacao-Maracaibo	Jan. 12, 1906 ..	..
Tarifa-Tangier	Jan. 18, 1904 ..	..
Port Arthur-Chifu (Closed)	Mar. 9, 1904 ..	..
Garachico-Santa Cruz	July 12, 1906 ..	..
Las Palmas-Arecife	Aug. 18, 1906 ..	..
Brest-Dakar	July 22, 1907 ..	..
Dardanelles-Tenedos	Sept. 17, 1907 ..	Sept. 18.
Midway Island-Guam	Sept. 22, 1907 ..	
New York-Cape Haytien	Sept. 22, 1907 ..	
Landlines.		
Puerto-Barrios	Aug. 9, 1902 ..	..

Telegraphists' Strike in the U.S.A.—To all appearances the strike has proved an absolute failure. The Western Union Telegraph Co. announces (says Reuter) that telegrams for all important points east of Pittsburg and north of Washington are no longer subject to delay.

Wireless Telegraphy.—Mr. Marconi is now at Glace Bay again, after a visit to England, and states that after three weeks' trials, the trans-Atlantic service will be thrown open for public use.

CONTRACTS OPEN and CLOSED.

OPEN.

Antwerp.—October 17th. The municipal authorities are calling for tenders for the installation of electric light in the Salle de Fêtes recently erected in the Place de Meir, Antwerp. A deposit of 8,000 francs (about £320) will be required to qualify any tender. Specifications from the Hotel de Ville, Antwerp, at a cost of 0·50 franc. A copy may be inspected by British firms at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C.

Austria.—October 15th. The Municipal Authorities of Schoenberg, in Mähren, require tenders by October 15th for the erection, equipment, &c., of a central power station. Details may be obtained from the Bürgermeisteramt (Abtheilung Bauamt), of Nähr-Schönberg.

Australia.—New South Wales.—October 23rd. Galvanised iron wire, 1,600 insulators and 500 wall telephones, for the G.P.O., Sydney. Specifications, &c., may be seen at the Electrical Review offices.

Melbourne.—October 4th. 466 d.c. and 200 a.c. meters for the City Council. See "Official Notices" to-day.

Melbourne.—November 12th. 6,000 dry cells for the Deputy Postmaster-General of Victoria. Commonwealth Offices, 72, Victoria Street, S.W., or Board of Trade Commercial Intelligence Department. Specification can be seen at the offices of the Electrical Review.

New South Wales.—October 30th. Copper wire for the Deputy Postmaster-General. Commonwealth Offices, 72, Victoria Street, S.W., or Commercial Intelligence Branch of Board of Trade.

New South Wales.—October 30th. The Postmaster-General at Sydney requires tenders for 21,000 best white porcelain insulators; 55½ tons hard-drawn copper wire, 300 lb. per mile; 15 cwt. copper binding tape, 300 lb. per mile; 62 tons galvanised iron wire, 500 lb. per mile.

New South Wales.—November 6th. Postmaster-General's department. Tenders are required by November 6th as follows:—14½ tons hard-drawn copper wire (300 lb. per mile); 4 cwt. copper binding tape (200 lb. per mile, $\frac{7}{8}$ in. wide); 3,500 large insulators (best white porcelain); 1,000 tallow-wood cross-arms, 3 ft. 10 in., complete; 2,500 ditto, 5 ft. 2 in. Specifications and general conditions may be seen at the office of the Electrical Review.

New South Wales.—December 11th. Tenders will be received at the office of the Deputy Postmaster-General, Sydney, for the supply and delivery, at the Central Exchange, General Post Office, Sydney, of the following: 1,000 telephones, wall, common battery; 100 telephones, table, common battery. Specifications may be seen at the office of the Electrical Review.

South Australia.—January 8th, 1908. One common-battery switchboard and 3,000 subscribers' telephones (specification No. 166) for the Deputy Postmaster-General, Adelaide. Specifications can be seen at the Commonwealth Office, 72, Victoria Street, S.W.

Victoria.—January 7th, 1908. The Postmaster-General requires tenders for 11 sections of a common-battery switchboard and 3,000 subscribers' telephones and other apparatus, for the telephone exchange at Windsor.

Belgium.—The municipal authorities of Flemalle-Haute (province of Liége) have just invited tenders for the concession for the public and private electric lighting of the town.

Belgium.—(No date fixed.) The Belgian State Railways, 11, Rue de Louvain, Brussels, will shortly call for tenders for annual supplies of materials and appliances for lighting trains by electricity.

They also require for Tournai Railway station supplies as follows: (1) 36 iron standards; (2) two switchboards; (3) fittings; (4) insulators; (5) bronze wire, &c.; (6) insulated cable and wire; (7) galvanised iron wire, 7 mm. in diameter, hoisting cable, &c.

Bradford.—October 5th. Electric wiring installation, telephones, bells, at the Union Hospital, Horton Lane, Bradford. Clerk to Guardians, 22, Manor Row, Bradford (deposit £1 1s.).

Brussels.—(No date fixed.) The Molenbeck freezing works require tenders for a complete installation (Glaceries de Molenbeck prés de Bruxelles).

Clacton.—October 2nd. Vulcanised bitumen distributing mains and service cables. See "Official Notices" September 20th.

Cologne.—October 9th. The Telegraph Construction Branch of the Prussian Railways requires 40,000 tons bronze wire. Particulars may be obtained up to September 25th, for 6s. each, at the Hausverhaltung of the k. Eisenbahn Direction, Dornhof 28.

Dublin.—September 30th. 500 a.c. single-phase, and 100 a.c. three-phase meters for the Corporation Lighting Committee. See "Official Notices" September 13th.

East Indian Railway.—October 2nd. Supply and delivery of one 600-kw. generator for the East Indian Railway Co. See "Official Notices" September 13th.

Egypt.—November 1st. The Alexandria Harbour authorities require tenders for the construction of an electric power station and for the following plant, to be worked by electric power:—Five transporters of large range; five ditto of smaller range; six cranes of 4 tons each; 36 cranes of 2 tons each; 25 capstans; cables, feeders, &c. Particulars may be obtained from the Directeur des Postes et Phares.

Grimsby.—October 21st. Switchboard panels for the Corporation electricity department. See "Official Notices" to-day.

Italy.—November 4th. The municipal authorities of Acireale, in the province of Catania, require offers for the installation and working of an electric lighting and power installation, for 30 years. The city will contribute £1,480 per year for 112,278 kw.-hours, and the company must deliver any further energy required for lighting at 3½d. per kw.-hour. A deposit of £160 is required. Tenders are to be made to the Sindreo, and the amounts and names are to be considered strictly confidential.

L.C.C.—October 8th. Three electrically-driven boiler feed pumps (each 9,000 gallons per hour capacity) for the East Greenwich tramway generating station. See "Official Notices" August 30th.

New Zealand.—December 11th. The Napier T.C. requires tenders for electric tramways, lighting and power supply. Frank N. Bower, Town Clerk.

(*Continued on page* 543.)

ACCESSORIES AND FITTINGS FOR ELECTRIC LIGHTING, HEATING AND POWER.

In the following pages we have brought together particulars and illustrations of a great variety of new electrical manufactures that are now being introduced, and improvements in, or adaptations of, others that are already known. These may be regarded as representative of the latest efforts that are being made by our manufacturing firms and suppliers to meet the ever-changing requirements of those interested in electric lighting and power installations and undertakings in this country, and also the needs of those concerned with the export trade to the British Colonies and foreign markets.

The ground covered is wider than in our previous annual issues of the kind, in which we have chiefly limited ourselves to Electric Lighting Fittings and Accessories and Heating Apparatus. On this occasion we have also included an interesting variety of power installation accessories, motor-driving applications, new switchgear manufactures, and general electrical apparatus and instruments.

We venture to believe that all who have any business dealings with the electrical industry will find this collection of material of great value for reference, both at the present time and during the coming season. In the foreign and Colonial markets where the Electrical Review has a large number of regular readers, this index to electrical manufactures will, doubtless, promote an increased business for "Home" firms. To other readers who may not be direct purchasers, the information here given should also be of considerable assistance in keeping them in touch with the latest doings of most of the electrical manufacturers dealing in the particular lines that have been covered.

Best & Lloyd's Electric Light Fittings.

Since we last referred in these pages to the doings of Messrs Best & Lloyd, Ltd., of Birmingham, in their electric light fittings department, they have made considerable additions to their London showrooms in order to have a more ambitious and more representative display of these particular manufactures. On the last occasion of our visit, the premises occupied by the firm at 11, Bartlett's Buildings, Holborn Circus, E.C., consisted of a ground floor and basement, both fairly extensive, but not enough so to allow of the display of both gas and electric fittings, and other art metal work specialities, on a sufficiently large scale. The upper floors of the building have now been taken, and these, as well as a large portion of the ground floor, are given up entirely to a very effective display of electric light fittings. The building is one of special interest, inasmuch as it dates from 1685, has the remains of a Queen Anne staircase on the top floor, has very old chimney pieces, and one of the rooms has a ceiling with original Adam style of decoration. In the new rooms the different designs are classified, "Adams" fittings being shown in one, "Empire" in another, Georgian, French, *art nouveau*, and so on, elsewhere.

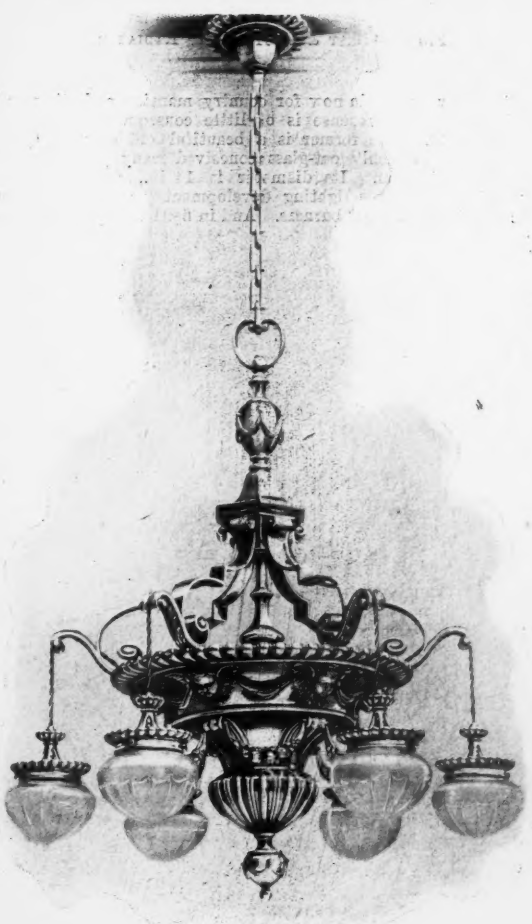

Fig. 1.—New Design of Electrolier. (Best & Lloyd.)

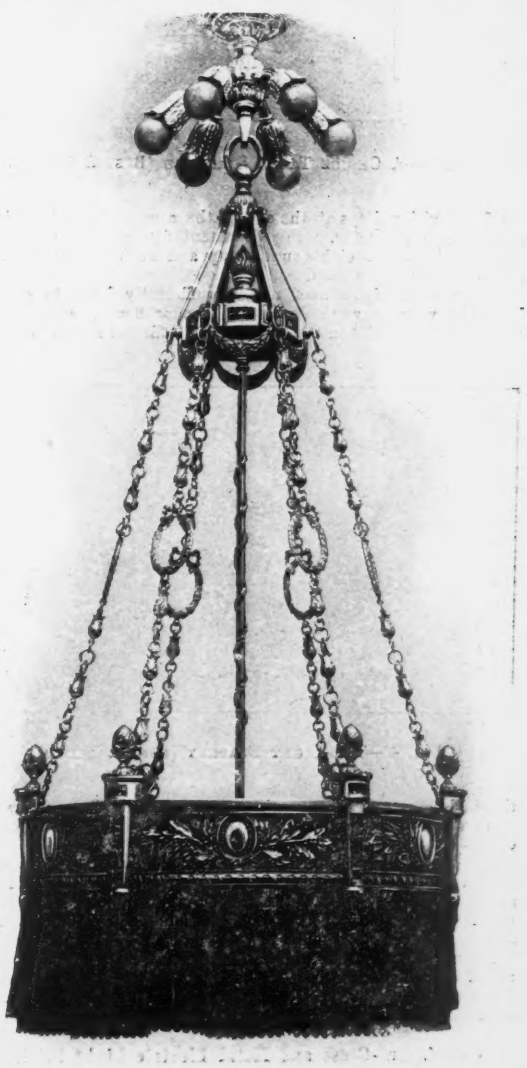

Fig. 2.—A High-Class Shaded Fitting with Ceiling Lamps. (Best & Lloyd.)

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Altogether the exhibit contains a very fine and various collection of high-class work, and we show a selection of some typical examples of those that we saw on view, in the accompanying illustrations. A good example of their work in electric radiators appears in fig. 5.

New Bank Standard.

The new patent Bank Standard fitting which appears in fig. 6 is the work of The Electrical Fittings Co., Ltd., of 38, Conduit Street, W.

The special feature about the standard is that, whereas in the ordinary way the lights are either fixed at one definite height or

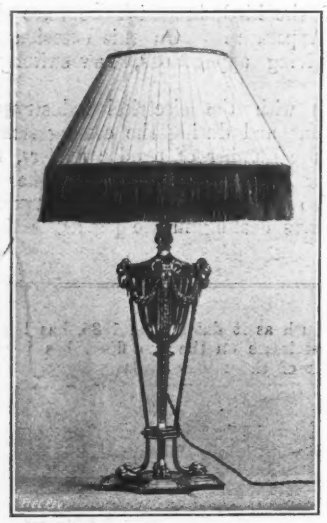


Fig. 3.—A Choice Table Standard (Best & Lloyd).

are fitted with pulleys at the end of the arms and counterweights, more or less unsightly, with this patent fitting there are merely cylindrical counterweights running up and down inside the main stem or stems of the standard.

The counterweights need not be sufficiently large to counterbalance a very heavy shade, as the circular flexible cord which is used passing round the top arms causes sufficient friction to retain

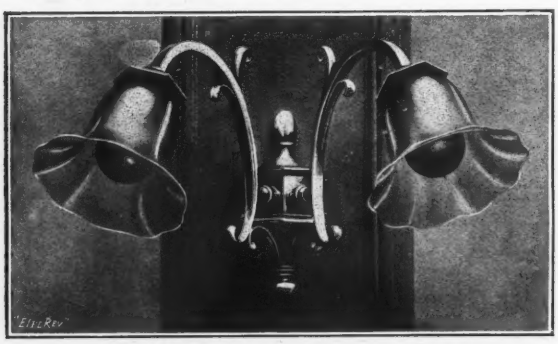


Fig. 4.—Two-Light Bracket (Best & Lloyd).

the shade at any height at which it is placed. The slack wire is taken up by forming a spiral at the lower part of the main stem of the standard.

The makers have supplied several for banks, and we understand that they have given satisfaction. In one case where the standard had only one arm, the latter was made to revolve so that the light could be placed in any position within a certain radius, and, of course, at any height.

These particular standards can be made with any number of arms, and if necessary can be so arranged that the act of raising or lowering one shade, will also cause the others to be raised or lowered automatically.

Osler's Cut-Glass and Metal Electric Light Fittings.

As we indicated in our issue of March 8th, 1907, in an article on "The Design of High Class Electric Fittings," Messrs. F. & C. Osler, of Broad Street, Birmingham, have long made a speciality of glass and art-metal work, and in both of these lines they produce much that is of interest to the electric lighting engineer, the architect, and the contractor. Their London showrooms, situated in Oxford Street, as we have already stated, are very capacious, but they were not originally built for the display of electrical metal fittings, though they answer for other branches of the firm's business. Elaborate and structural alterations are, therefore, now about to be commenced with a view to making the premises in every way suitable for the most effective arrangement and display of electrical fittings. Some of the designs that the firm have at present before the electrical trade and the consumer are shown in the illustrations which appear on the facing page (figs. 7 to 10). Two very choice examples in glass—which, by the way, is coming

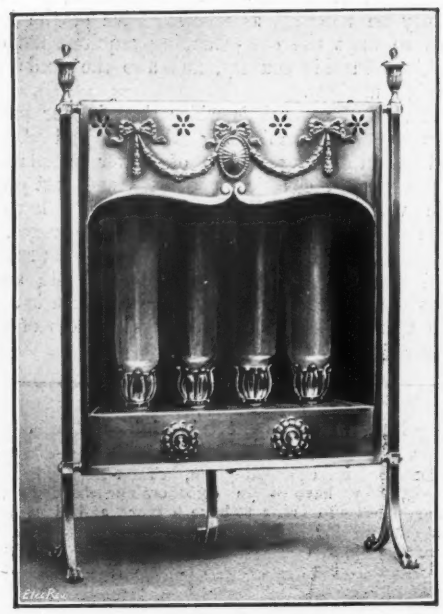


Fig. 5.—Best & Lloyd Lamp Radiator.

greatly into vogue again now for country mansion and other such installations where expense is of little consequence—appear in figs. 9 and 10. The former is a beautiful old genuine Queen Anne design in richly cut-glass conceived many years ago for candle illumination. Its diameter is 14 in., and its length 2 ft. 3 in. When gas lighting developments occurred, the same style was fitted with gas burners. And in fig. 1 it appears as it has

Fig. 6.—New Bank Standard (Electrical Fittings Co., Ltd.)

been, and is now being, supplied in numbers for Huntalite electric candle lamp lighting. Fig. 10 shows it in a further advanced and extremely pleasing and quite modern form (19 in. diameter), also for electrical illumination, the lamps being concealed in the trumpet, and in the bowl, so that no light reaches the eye directly from them. Fig. 7 depicts a light artistic pattern of electrolier—

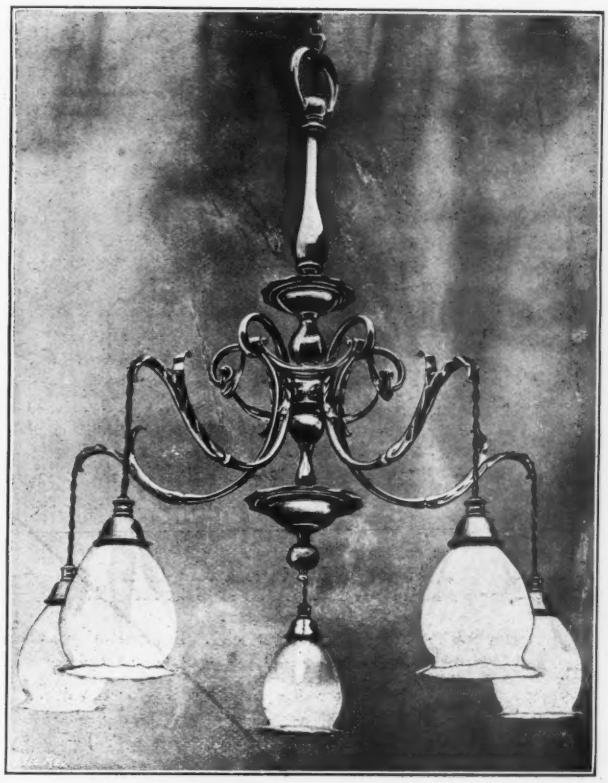


Fig. 7.—Drawing-Room Electrolier (Osler & Co.)

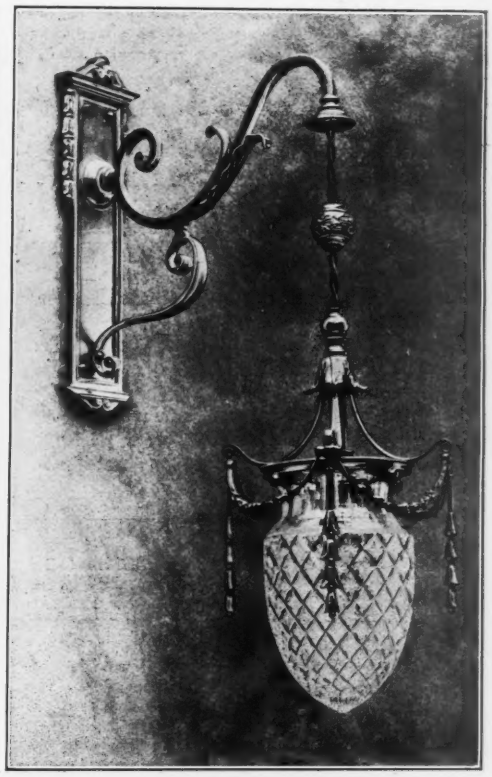


Fig. 8.—Old Gold or Gilt Bracket (Adam). (Osler & Co)

Fig. 9.—An Old Design of Cut-Glass Fitting Adapted for Electric Candles. (Osler & Co.)

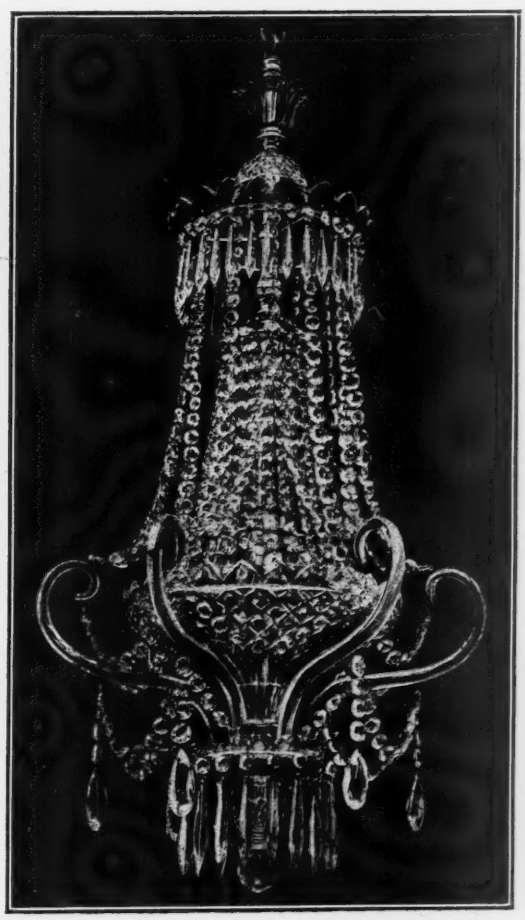


Fig. 10.—Cut-Glass Design with Concealed Lamps. (Osler & Co.)

purely modern—for drawing room use, which is supplied 18 and 20 in. in diameter, in either polished brass or oxidised silver. An old gold or gilt bracket design—the result of a study in the Adam style—shown in fig. 8, embodies some very choice work, and is an example of which the makers are justly proud.

Ship's Electric Fittings.

The Birmingham Guild of Handicraft, Ltd., of 45, Great Charles Street, Birmingham, and London, are now making a special line of fittings suitable for ship and railway work, of

Fig. 11.—Birmingham Guild Ship's Fitting.

simple and effective design, one of which we illustrate (fig. 11). One of the chief advantages of these fittings is that they have wrought metal reflectors, thus avoiding any chance of breakage.

Evered's Electric Light Fittings.

The manufacturer and supplier of both gas and electric lighting fittings may be said to see more of the result of the competition between rival illuminants than most others connected with the industries. After years' experience in both departments, and with

Fig. 12.—Evered Two-Light Bracket.

a name well-known to the engineers and managers on each side in the fray, they may be able to tell us many interesting things, for they have the opportunity to survey the progress of both parties

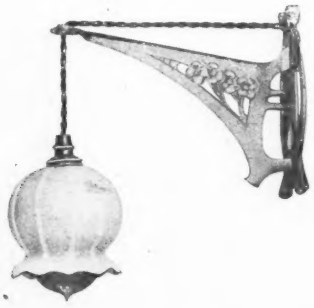


Fig. 13.—A Neat Bracket (Evered).

from their own coign of vantage. So far as this applies to Messrs. Evered & Co. their experience shows that inverted gas lighting has been more successful in gaining the favour of the consumer, which means that the demand for electric fittings has not lately shown the same life as it did not very long ago. We visited Messrs. Evered's showrooms at Drury Lane, W.C., again a few days ago, as we have done annually for several years past, in order to see what they had on view in the way of electric fittings. A number of fresh patterns have, of course, been added during the year, and some of these—an electrolier and a couple of single and one double

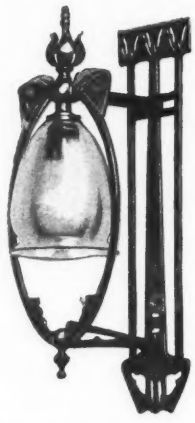


Fig. 14.—A New Style in Brackets (Evered).

arm bracket are illustrated herewith. For most of the electrolier examples on exhibition there are also shown brackets of corresponding design.

Those who are interested should write for the firm's No. 41 "Book of Metal Fittings for Electric Lighting," wherein they will

Fig. 15.—A New Electrolier Design (Evered).

find many pleasing examples of bracket fittings and ceiling lights, which are supplied either polished or in silver antique finish, also sliding pendants, fine and various electrolier designs, drop pendants,

lanterns either with clear muffled glass panes, etched citron globes, ruby-threaded acided glass, leaded glass panes, or opalescent cylinders. There are also a number of acceptable styles bearing fancy shades in silk. Table, newel and floor standards, as well as some examples of billiard lighting work, are also set out. Messrs. Evered, in addition to fittings work, are also manufacturers of switchgear, motor starters, switchboards, and distributing boards. These are dealt with separately in their "Catalogue of Switchgear and Motor Starters."

Sambidge's Electric Fittings.

Messrs. H. W. Sambidge & Son, Ltd., of Birmingham Chandelier and Gas Fittings Works, Highgate Street, Birmingham, have been engaged during the last 12 months in designing and placing upon the market a considerable range of new electric fittings, chiefly Adams, Louis and Sheraton styles. At their London showroom, Cecil House, 57A, Holborn Viaduct, E.C., which, we understand, is visited by customers from all parts of the country, may be seen a large assortment of these new designs.

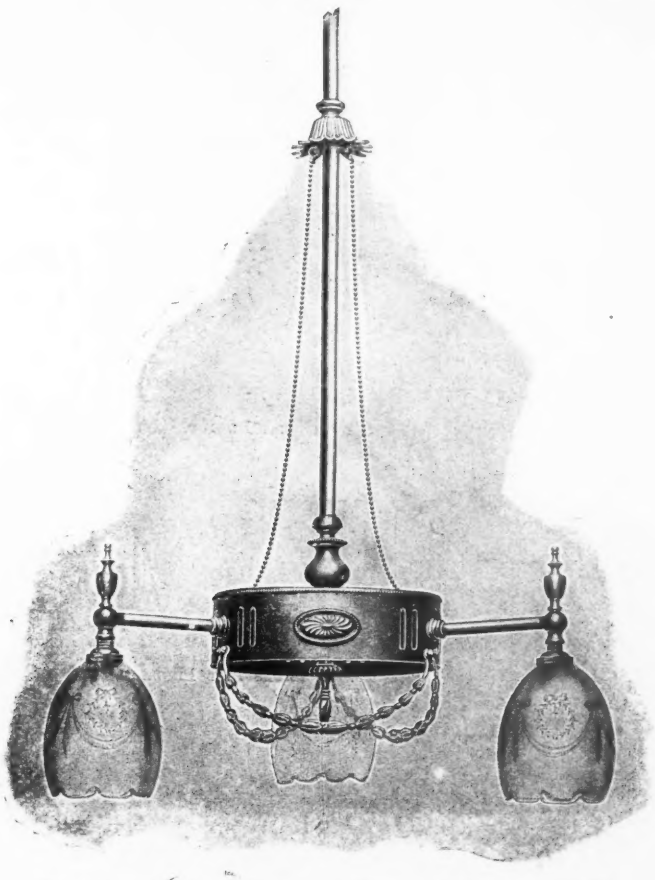


Fig. 16.—Three-Light Pendant in Sheraton Style. (Sambidge)

Fig. 17.—Sambidge Festoon Pendant.

Though during the early part of the year the trade in electric ornamental fittings was rather quiet, we learn that during the last few months it has shown considerable improvement, especially in the Colonial and foreign markets.

Two recent designs are shown herewith, fig. 17 being their No. 3,350 neat festoon one-light pendant for suspension by flexible, and fig. 16 their No. 3,394 three-light pendant in Sheraton style, with richly chased festoons and medallions on corona band. These pendants are gilt-finished, and, together with a line of Adams pendants, may be taken as representative of a large range of similar goods recently introduced.

Metal Core Flame Carbons.—In electric arc lighting the use of the ordinary carbon has not increased during the last two years at the same rate as when that type had the market to itself. For exterior lighting the flame-carbon lamp is rapidly extending. Future experience will prove whether the flame-carbon will also be generally preferred for interior lighting as it now is for railway stations, &c. In view of the foregoing, the Planiawerke have paid special attention to the perfecting of their flame-carbons according to the present knowledge available. The flame-carbons of the Planiawerke are supplied with different compositions for direct and alternating current, and it is claimed that by attending to the peculiarities of the two currents, it has been possible to increase the light without prejudice to its steadiness and brilliancy. The flame-carbons ought to be manufactured for long-burning lamps in lengths up to 670 mm., and for these carbons the electrical resistance is so great that the voltage on the arc is changed during the burning of one pair of carbons. In order to diminish this change as far as possible, the carbons are usually fitted with a metal wire, either fixed in a special channel or pressed into the core itself. With the former method, it is found that in consequence of the wire becoming warm in burning it loses its elasticity, so that no good and certain contact can exist between the wire and the sides of the channel, which renders the effect of the core illusory.

For this reason the Planiawerke A. G., Berlin, are pressing the metal wire direct into the core of the carbon, obtaining, they claim, in this way a sure and never-failing contact between the wire and the carbon. Many large electrical concerns are stated to be using these carbons in their new lamps because they ensure a greater constancy of the voltage, apart from the steadiness and brilliancy of the light. The flame-carbons of the Planiawerke are made in different colours, viz., "yellow," which gives the best light and is therefore most used; "white," with a slight yellow touch, specially preferred for its steady light; and "extra white," giving a clear white light. They are also manufacturing a carbon with a reddish light.

The Phictoria Lamp.—Messrs. Pooley & Austin, of 25, Victoria Street, S.W., are at the moment putting on the market a new incandescent lamp, made by a British factory, for which they have registered the name "Phictoria." They are supplying these lamps for all voltages and in all the usual or fancy shapes. For a large circular globe with 50-c.p. filament, they have registered the name "Phictorialite." For a medium-sized globe with 25-c.p. filament, the name is "Phictorlite," and for a small circular globe with 18-c.p. filament, the name is "Phiclite." In the same grade of lamps they are supplying tubular heaters. The same firm are also putting on the market various lubricating oils with the registered name "Phictorioline." These oils are being manufactured for them by one of the oldest established oil works in the country, and we understand that their composition has been arrived at after many years of careful scientific study and experiment.

Motor-Driven Disk Grinders.—Mr. F. Woolnough, of St. Stephen's, Norwich, wants the trade to know that he is now manufacturing self-contained disk grinders driven by electric motors, of which he will send prices and particulars upon application.

Thursfield's Electric Light Fittings.

Messrs. C. J. Thursfield & Co., of 21a, Berners Street, London, W., and of Birmingham, whose work in the direction of artistic hammered fittings is already well known to the trade, are now, in addition to these lines, devoting a good deal of attention to developments in the direction of Georgian and Flemish styles. The company has a large showing of various artistic and well-finished designs, including a number of these new examples, in its fine showrooms in London at the above address. It may be as well to mention that most of the firm's designing work is done in London by Mr. Walker. A new pamphlet which is in course of preparation is specially devoted to these Georgian and Flemish fittings, but members of the trade and architects who are interested will find many of the lines that are on exhibition in the showroom in the list published several months ago. Copies of this will be sent on application. We show several recent examples of electrolier, pendant and bracket fittings in the accompanying illustrations.

Fig. 18.—A Well-finished Flemish Bracket.

Fig. 19.—Candle Electrolier Fitting—Flemish Style.

Fig. 20.—A Thursfield Pendant.

Marelli's Electric Fans.

Messrs. Ercole Marelli & Co., of Milan, whose works have been extended in a remarkable manner during the last two or three years, are doing a large business in electrically-driven fans. The firm has branches in more than a dozen places in different parts of the world, and if one may judge from the finely produced and excellently illustrated catalogue (76 pp.) which they have in circulation in the English language, they are a firm of considerable enterprise. A telegraphic code for the use of customers precedes a full description of direct-current desk and bracket fans, which is accompanied by neat half-tone pictures of different parts. Tables of sizes, voltages, speeds, current consumption, weights, prices and code words are compactly and clearly set out, and we find in the ist, treated in this way, universal joint bracket fans, cabin fans, many sizes of ceiling fans, port-hole, ornamental desk fans (a figure of Hercules bearing the fan motor body upon his shoulders). A.C. fans follow in similar style, and lead on to exhaust fans, small direct and alternating-current motors, A.C. transformers for electric bells and galvanoplastre, rheostats for sewing machine motors, also forge and volume blowers. In the accompanying figures we show some typical examples of Messrs. Marelli's fan work. Fig. 21 shows the D.C. universal-joint bracket fans, which has a ball and socket joint allowing the fan to be turned and adjusted to blow air in any direction. The fan can be either bracketed to the wall, or used on the desk by fixing the motor in a vertical position. The starting and speed regulating switch is located in the base. The standard finish is black japánned relieved with gold lines; blades, guard and all other brass fittings are nickel plated.

Fig. 21.—Universal Joint Bracket Fan.

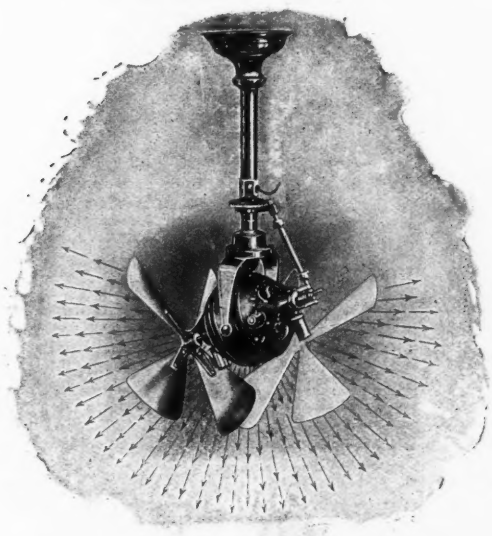


Fig. 22.—Self-Rotating Multiple Ceiling Fan.

Fig. 22 represents a D.C. patent self-rotating multiple ceiling fan, which is specially recommended for large rooms. It is claimed that while the fan is running, a slow rotary movement is impressed on the motor round the vertical axis of the ceiling rod. By this device, a cooling breeze is spread all over the room where the fan is fixed. When two or more fans of this type are fixed in one room, all their draughts, intersecting and crossing each other, will create a general and well distributed ventilation, which will permeate the most secluded corner, where the draught from ordinary ceiling fans would be inaccessible. A wall speed-regulating switch can be supplied with this fan.

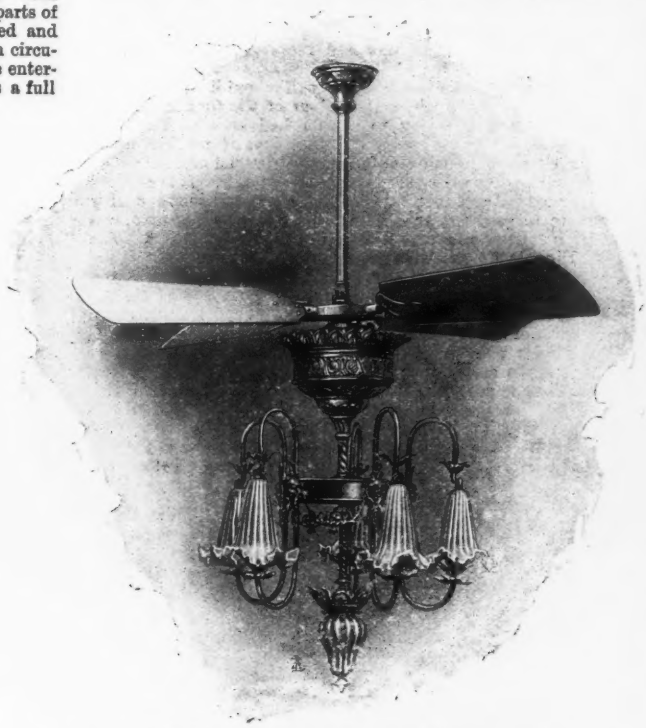


Fig. 23.—Combined Ceiling Fan and Electrolier.

Fig. 23 illustrates a 60-in. sweep D.C. ceiling fan which has been specially designed of extra strong construction for carrying heavy and large electroliers. The central spindle is fixed with the ceiling rod, and the hollow shaft carrying the armature is made to revolve round it. It is fitted with self-oiling lubricators. Each segment of the armature winding is separately wrapped with a strong tape, previously submitted to a special varnishing process, whereby it becomes securely insulated and perfectly protected from atmospheric moisture. The standard finish is: Body of the motor blacked japanned; ceiling rod, canopy and brass cover—nickel or gold plated. During the winter the blades can be removed making it an ornamental and serviceable lighting fixture. There is no rheostat embodied in the motor itself, and different speeds can be obtained by wiring in connection with a special wall switch rheostat.

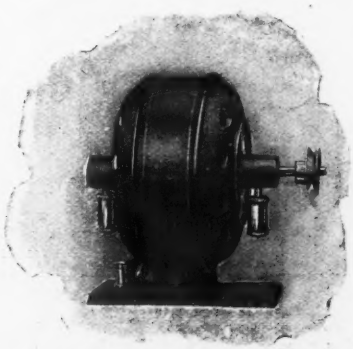


Fig. 24.—Marelli Motor of $\frac{1}{10}$ H.P.

Fig. 24 shows a specimen of their small electric motors, which are supplied for 110 to 150 volts, in sizes $\frac{1}{30}$, $\frac{1}{20}$ and $\frac{1}{10}$ H.P.

In a small eight-page pamphlet, the firm give particulars in English, French and German, of a number of such lines. From diagrams appearing in the catalogue, we observe that, whereas in 1902 there were about 100 workmen employed by the firm, and the exported fans numbered for the year about 5,000, in 1906 there were 600 workmen, and the fans exported totalled some 30,532 for the year.

G.E.C. Armorite Fittings.

We mentioned a few months ago that The General Electric Co., Ltd., of 71, Queen Victoria Street, London, were introducing "Armorite," a new metallic medium, which can be worked up into electric, gas, or oil fittings, door furniture, gates, grilles, railing, &c. We show a couple of new and representative designs of fittings in this metal in figs. 25 and 26.

In appearance the metal is not unlike oxidised silver or armoured steel, having the beautiful colour of the former with the texture of the latter, giving to the finished article an artistic quality that has an especial value in these days of machine-made goods. The technical qualities of this new material are a blend of toughness with rigidity, strength and great ductility. It is claimed to be incorrodible and to retain its soft silver-like lustre during exposure to sea-air, fog or dampness. This, we understand, was proved by practical tests carried out over an extended period. The General Electric Co. are endeavouring in their usual enterprising way to bring its claims before the notice of electrical engineers and contractors and architects, and are exhibiting a range of electric fittings, door furniture, switch-plates, staircase panels, hinges and general interior ironwork, which give an excellent idea of the possibilities for manipulation and application. We are informed that their works are now engaged upon a number of large contracts for electric fittings made in "Armorite" to their own special designs, amongst them being some large ones for a northern cathedral, each fitting having a diameter of 9 ft., and being massive in proportion. Amongst the orders in hand are the electric fittings for a number of churches, public libraries, municipal offices and private houses. The prices are understood to range considerably below those charged for oxidised silver, polished brass or copper, and are slightly in excess of those charged for wrought-iron. The illustrations show how adaptable the new material is to ordinary requirements.

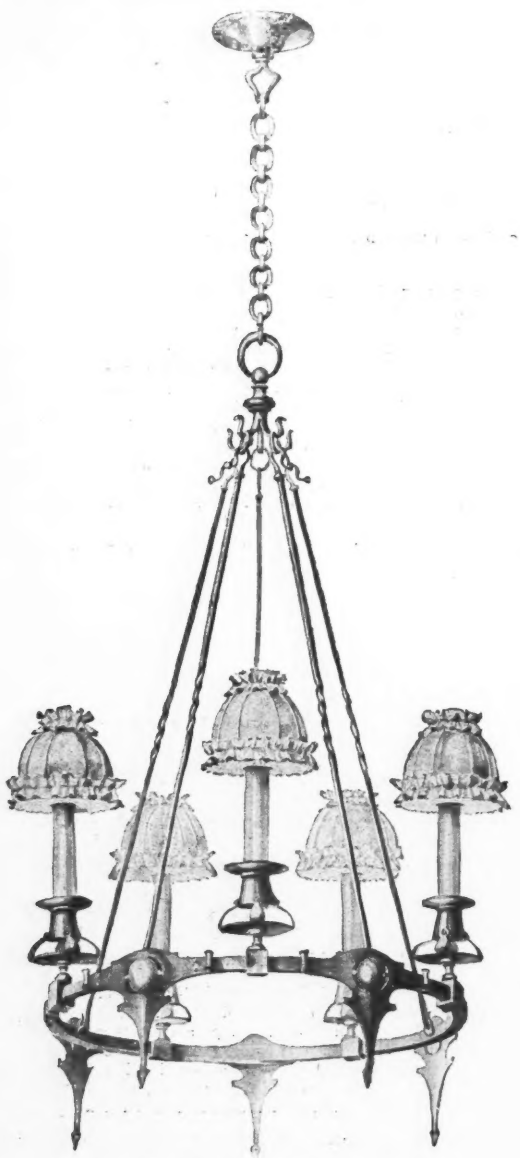


Fig. 25.—Electrolier in "Armorite."

Lubrication.—From the "Uneo" Asbestos Lubricating Co., Ltd., of Parr Street, Liverpool, we have received a small pamphlet relating to "Uneo" asbestos lubricants, which are in extensive use in America in all kinds of engineering, shipping and machinery trades generally. The above company have made arrangements for the introduction of this system into Great Britain, and orders from leading and various engineering, shipping and manufacturing firms are being booked. The advantages of the system are set out in the pamphlet. We gather that the "Uneo" oils and grease compounds are doing service for dynamo and other machinery, and also for electric railway car journals.

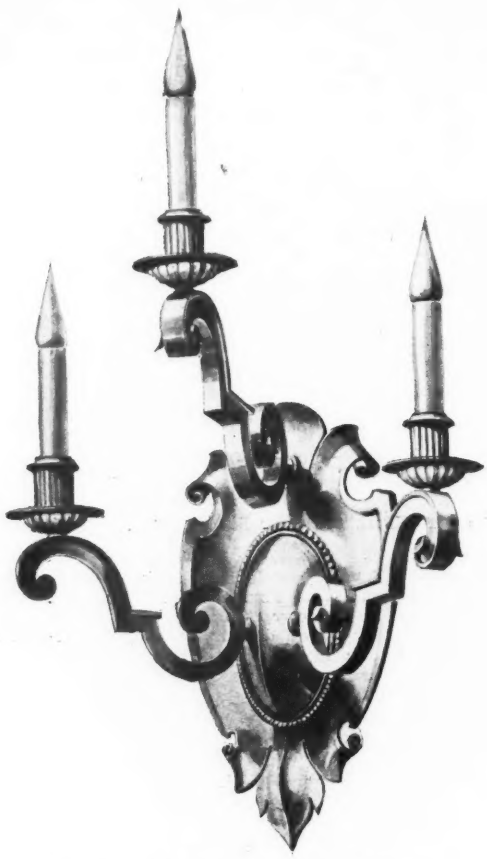


Fig. 26.—"Armorite" Bracket Fitting.

Harbinger Patent "Standard" Metallic Packing.—The Harbinger "Standard" metallic packing has now been before steam users and engineers for over ten years with good results. Since its introduction the sole makers, Messrs. John Stewart & Son, Ltd., of 22, Billiter Street, London, E.C., have devoted considerable time and experience to improving and perfecting the packing.

It is not easy to explain the different arrangements of the system, as each packing is designed to suit the circumstances under which it has to work, and they are numerous. The "Standard" packings are automatic in their action, and will move freely to any movement of the rod, with ample clearing space in the stuffing box, which allows the whole packing freedom to do its work. They also make special draining arrangements, which is a matter of great importance, particularly in marine engines, where loss of water is very serious, and has to be made up by costly evaporators. All these losses they take direct to the condenser from the stuffing boxes.

The various designs of the "Standard" metallic packings have been made to suit the requirements of all the present-day engines, and particularly the existing stuffing box and gland arrangement, thereby obviating any alterations.

The packings are now at work on all kinds of engines, and we are informed that in numerous instances they have been continuously at work for over nine years without renewal of the white metal blocks, which are made of a special alloy of the firm's own manufacture, and contain the highest anti-friction properties, in proof of which it is stated that even after two or three years' running the original tool marks can still be seen. All their packings are made in halves, and so constructed that the packing blocks and springs are securely fastened in their respective casings, which enables the engineer to take the packing out for examination at any time, even when the engines are hot, without danger of losing or damaging any of the parts.

Foster Lamp Specialities.

The Foster Arc Lamp and Engineering Co., Ltd., of Wimbledon, S.W., have been making great strides during the past year in the manufacture of their patent arc lamps. Their new direct-current solenoid lamp, which we illustrate in fig. 27, has become very popular, especially the 4½-ampere lamp of this class. The burning hours of this lamp have been improved, so that one trim of carbons gives some 60/80 hours' burning. The lamp is solidly constructed, and has proved very reliable in working.

About six months ago the company placed upon the market a new flame arc, which is being largely adopted by railways and Borough Councils for lighting purposes and in positions where long-burning and absolute reliability are of the first import-

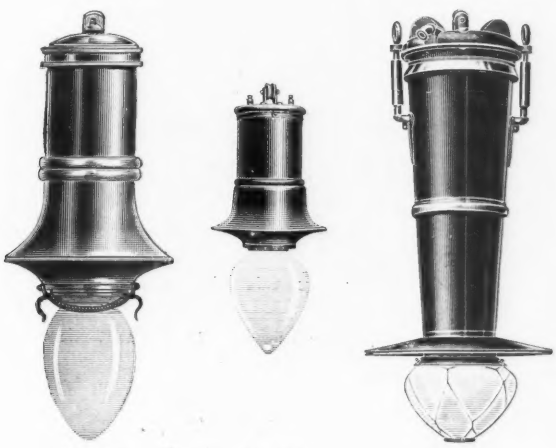


Fig. 27. Fig. 28. Fig. 29.

Foster Arc Lamps.

ance. The lamp (fig. 29) contains no clockwork mechanism, and is British made throughout.

Automatic cut-outs and substitutional resistances are fixed inside the lamps, rendering their appearance very neat and compact.

The Foster miniature arc lamp (fig. 28) is now so well known that it does not require further description; nearly 10,000 of these lamps are being used throughout the country and abroad, on all kinds of circuits and under every condition of supply.

We understand that the firm has also been engaged in making small transformers up to 5-kw. capacity, and is well equipped for supplying these devices for special conditions at very short notice.

Some B.T.-H. Illuminating Specialities.

During the present year the British Thomson-Houston Co., Ltd., of Rugby, have developed some new specialities for electric lighting, including flame and twin-carbon arc lamps and a high-efficiency incandescent lamp.

The flame arc lamp, shown in fig. 31, is constructed for either continuous or alternating-current working, and in two sizes: with 24-in. carbons burning 17 hours, or 16-in. carbons burning 10 hours.

Fig. 31.—B.T.-H. Flame Arc Lamp.

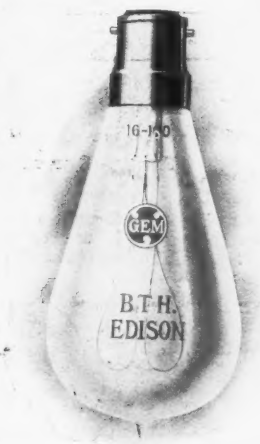


Fig. 32.—The B.T.-H. Edison Gem Lamp.

The differential method of control with shunt and series magnets is employed, and the carbons are arranged at an acute angle and fed by gravity.

The standard direct-current lamp is made for a current of 8 amperes, and the alternating lamp for 10 amperes, 50 cycles.

The twin-carbon lamp, illustrated in fig. 30, has been specially developed for outdoor use, or in foundries and places where corrosive fumes exist. The lamp is suitable for single operation on high-voltage circuits up to 250 volts pressure; it has two arcs in series within the enclosing globe, and consumes about the same power as the 5-ampere series-multiple lamp, giving a perfectly steady white light. The line resistance is of the external pattern, enabling the lamp casing to be made small and compact, and the negative carbon holder is so arranged that no shadows are cast.

In both the above types of lamp the coils are wound with a patent enamelled copper wire, which is unaffected by heat or moisture. The high-efficiency incandescent lamp which the company is introducing as the B.T.-H.-Edison Gem lamp, is of the metallised carbon filament type. Its economy in energy consumption can best be gauged by comparison with a good 16-c.p. carbon filament lamp, which, for a useful life of 800 hours, would consume 56 watts, as compared with 46 watts in the case of the 16-c.p. Gem lamp. The lamp is made for either alternating or direct current 100-125-volt circuits, and can be used in any position; it is claimed to be the only English-made high-efficiency lamp consuming less than 3 watts per candle, and is shown in fig. 32.

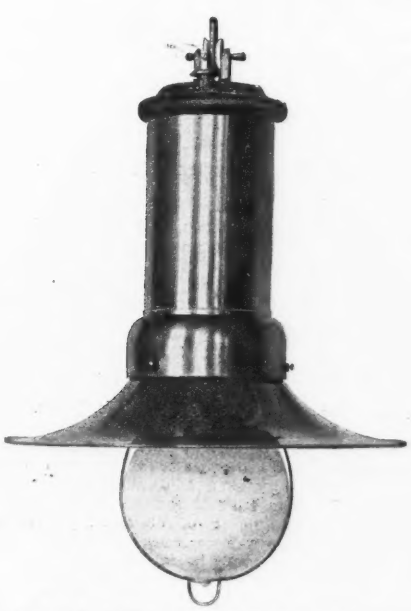


Fig. 30.—B.T.-H. Twin-Carbon Arc Lamp.

"Handy" Lamps and Holders, and "Glowire" Strip.

Under these titles The Gabriel Lamp Co., of 15, Victoria Street, S.W., have introduced some ingenious devices, of which we give illustrations herewith. Fig. 33, p. 504, shows the "Handy" cap, which is provided with loop contacts; fig. 34 shows a brass clip pushed through a flexible; by inserting the end of the clip in the loop, flattening the latter, and turning up the end of the clip, the lamp can be attached to a twin flexible without a lamp-holder, as shown in fig. 35.

Any number of lamps can thus be strung on a suitable length of flexible or other twin conductor, to form a festoon, at a minimum expense; and by passing the clips also through a ribbon of thin red fibre between the cap and the flexible, the "Glowire" strip is formed, which is supplied in lengths without the lamps, and can be

utilised in the construction of illuminated signs, &c., the strip being stiffened where necessary with wooden laths. The combination of these devices provides a simple and ready means of

Fig. 33.—"Handy" Cap.

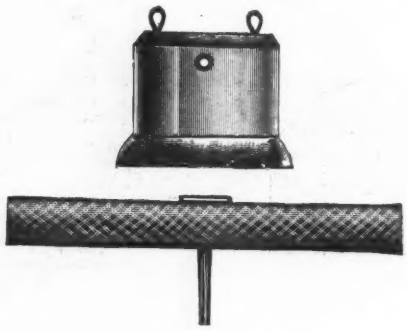


Fig. 34.—Clip through Flexible.

rigging up lamps for temporary lighting; and when they are no longer required for this purpose, the lamps can be used in ordinary bayonet holders, the loops being first flattened down.

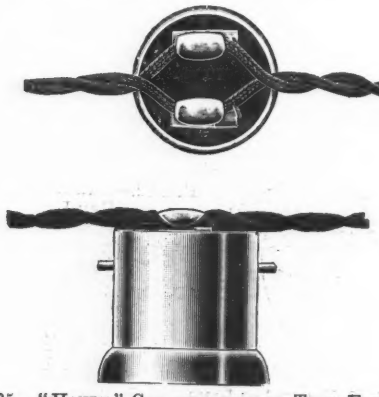


Fig. 35.—"Handy" Cap attached to Twin Flexible.

Fig. 36 shows the "Handy" lamp-holder, which is provided with hooks to fit the loops of the "Handy" caps, instead of spring plungers. The pins are first cut off the caps, and the sleeve of the

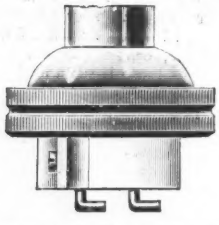


Fig. 36.—"Handy" Lamp-holder.

holder (not shown) is slipped down over the cap, with the union ring; the cap is then fixed on the hooks, the sleeve replaced and the union ring screwed up tight. Held in this way, the lamp cap cannot possibly shake loose; this holder is therefore recommended for railway and tramway cars, and other places where there is vibration, dirt, &c.

The "Magnet Juno" Flame and other Arc Lamps.

The "Magnet Juno" (fig. 37) is a converging carbon flame lamp of great simplicity, manufactured by Messrs. Johnson & Phillips, Ltd., of Old Charlton. The general features of the earlier Juno lamp have been retained, but an electromagnet is now employed in place of the original hot wire for striking the arc. The feed is effected solely by gravity, and there is an entire absence of shunt coils and dash-pots.

The terminal pressure required is about 50 volts per lamp. The lamps are supplied for either alternating or continuous current working, for any current between 6 and 12 amperes.

In order to meet the demand for a low current flame lamp, this firm has also introduced a vertical carbon flame lamp suitable for burning with a current of 3, 4 or 5 amperes, 4 or 5 in series on 200-220 volts or 6 in series on 230-240 volts. The lamp is very neat in appearance, and the mechanism is of quite a simple nature. The lamp is fitted with a small opalescent globe and a clear glass ash-tray.

With five lamps burning on 220 volts, with 3·5 amperes of current, each lamp consumes only 154 watts, including its proportion

Fig. 37.—The "Magnet-Juno" Flame Lamp.

of steadying resistance. With energy at 3d. per unit, this works out at rather less than ·5d. per lamp-hour.

Drake & Gorham's Arc Lamps.

In Messrs. Drake & Gorham's price list of Jandus arc lamps just issued for the 1907-8 season, reduced prices are announced. The "Premier" and the "Imperial" new models of these lamps are included. The "Imperial" type VS we illustrate in fig. 38. The new features of this lamp are that the shunt and series coils are now wound on separate bobbins; the negative frame is inside the

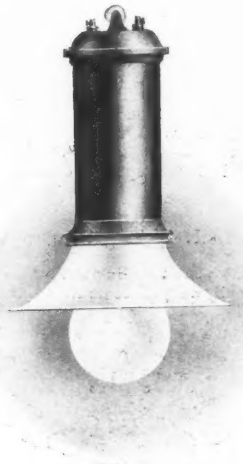


Fig. 38.—The "Imperial" Jandus Lamp.

globe instead of outside as hitherto, and the globe is supported round the neck without any bottom fitting to obstruct the light. Another feature is that the lamps strike at their normal current.

Other price lists are in circulation giving prices and details concerning the Osram lamps, and tantalum lamps and accessories, for both of which lines the firm are wholesale agents.

Transformer, and Hand Polishing Machine.

Messrs. S. Wolf & Co., of 138, Southwark Street, Blackfriars Bridge, London, S.E., are about to place on the market a transformer for reducing high alternating-current voltages such as 30,000 volts to 100, and arranged so that the low-pressure voltages can be tapped off at pressures of 100, 200, &c., up to 1,000. These transformers are very small, only ranging from ·3 to 3 K.V.A., and they will be of interest owing to the number of electrical power companies generating high alternating voltages.

Messrs. Wolf have also lately brought out a hand polishing and grinding machine, completely enclosed, and fitted throughout with ball bearings, for vice work, dressing castings, &c. We are informed that the labour-saving capabilities of this machine have exceeded expectations.

Silvered Glass Reflectors.

We illustrate herewith two, out of many, patterns of silvered glass reflectors that are being made by the Kevan Electric Co., Ltd., of 88, Charing Cross Road, W.C. Fig. 1 shows a dome, and fig. 2 a shell pattern. These shades are made of crystal glass,

Fig. 39.—Dome Shade.

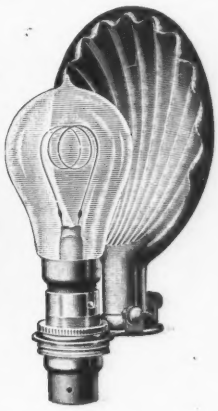


Fig. 40.—Shell Reflector

silvered with silver, and provided with metal carriers to suit any fitting. The silver being enclosed by glass, it cannot tarnish or get scratched. The company also supply a variety of A.C. and D.C. electric fans.

The "Thomson" Pocket Lamp.

Messrs. L. E. Wilson & Co., of 20, Cross Street, Manchester, are in the market with several lines that may be mentioned. The Knowles's patent porcelain lamp-holder is being used in two types—sealing-in and cord-grip respectively—in chemical works, paper mills, battery rooms and in saline atmospheres. The Wilson-Birtell twin ignition regulator for low-tension magneto is another of their specialities. Both of the foregoing are particularised in publications recently issued by the firm. Their other feature, which we illustrate herewith, is the "Thomson" patent pocket

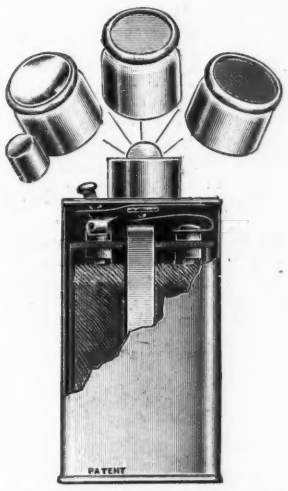


Fig. 41.—The Thomson Pocket Lamp.

lamp. This lamp is not a toy, but a commercial article, strong reliable and compact. The construction is shown in fig. 41, and in fig. 42 it appears in a special case adapted for a cycle lamp. The specially designed accumulator is contained in a small nickel-plated case measuring $3\frac{1}{4}$ in. × $1\frac{3}{4}$ in., and is thought to be probably the smallest accumulator on the market. It can be recharged from the electric light current at a very small cost, and a special charging equipment can be obtained for this purpose. One charge will give six hours' continuous light, and as for ordinary purposes the light would be intermittently used, it is possible to obtain a life of two months from one charge, after which time the accumulator should be recharged even if unused.

The lamp is supplied with a removable bull's-eye cap, attached to which is a smaller thimble, which provides necessary protection for the switch when in transit or when carried in the pocket. The removable cap can be obtained in several forms for the various purposes of photographers, cyclists, motorists, &c.; for instance, ruby and yellow caps are supplied for the dark room.

The switch will light the lamp continuously or flash it at the will of the user. The charging accessories consist of a specially-made adaptor and lamp-holder combined, fitted with a flexible wire with clips for joining to the accumulator.

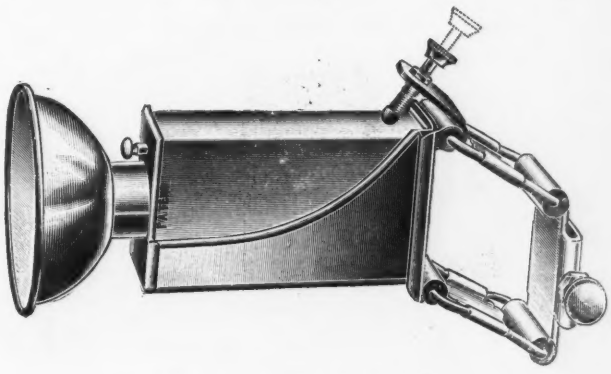


Fig. 42.—Thomson Cycle Lamp.

Prices of the lamps and instructions for users can be found in an illustrated pamphlet issued by Messrs. Wilson.

Carron Radiators.

Carron Radiators have already achieved such popularity as electric heaters, that lengthy reference to their construction is unnecessary here.

The Carron Co. have recently put on the market two new designs

Fig. 43.—Carron Three-Lamp Radiator.

of their radiators, which we illustrate herewith; one is fitted with three lamps and has a *repoussé* copper front, and the other with four lamps, has a *repoussé* brass front; both are good examples of

Fig. 44.—Carron Four-Lamp Radiator.

this class of work and admirably adapted for the purpose in view. They are supplied complete, with 6 ft. lengths of flexible, and plug and socket for fixing.

Supplies' Radiators.

The electric radiators of Messrs. Supplies, Ltd., 9, Parr Street, Liverpool, which have already been put before readers of the Electrical Review with particulars of their self-contained meter

Fig. 45.—Supplies' Radiator.

are, we understand, in general and very large demand for the present season. A radiator combined with a meter is of considerable

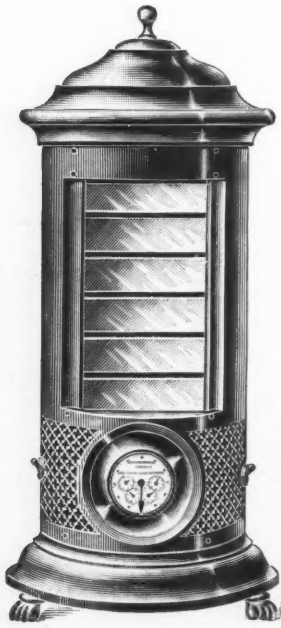


Fig. 46.—Supplies' Radiator.

service in obviating separate heating circuits, and on these grounds alone there is a great saving in cost to the consumer.

A couple of designs are shown in the accompanying figs. 45 and 46.

Large Heating Plant for Japanese Steel Works.

A Japanese firm has recently placed an order with Messrs. Davidson & Co., of Belfast, for the complete heating plant to be installed in a new steel works now in course of erection in the north of Japan. The plant, one of the largest of its kind as yet supplied to Japan, includes ten separate heater sets which are to provide heat for two large machine shops measuring 600 ft. × 130 ft. and 650 ft. × 168 ft. respectively.

Each set comprises a large "Sirocco" multitubular air heater, and an electrically-driven centrifugal fan. The air heater consists of a central furnace, from which the products of combustion are led through a series of tubes arranged horizontally on either side. The current of fresh air passes round the outside of the tubes, and there is no possibility of it becoming vitiated by coming into contact with the flue gases. Owing to the long distance the products of combustion have to travel before they reach the chimney, almost all the heat which can be obtained from the fuel is usefully applied in warming the air current, which makes it

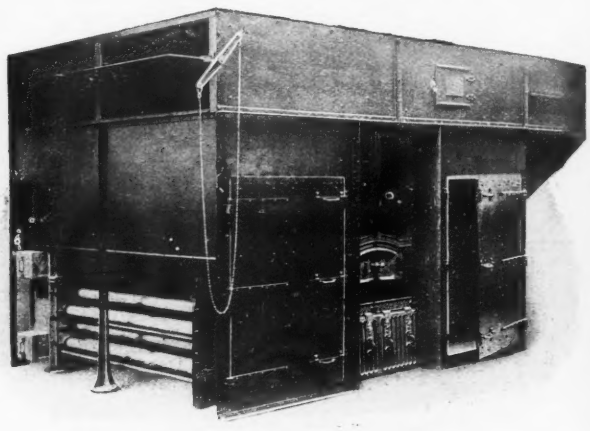


Fig. 47.—Sirocco Multitubular Air Heater.

possible for these heaters to warm a large volume of air with an exceedingly low fuel consumption.

Attached to the heater is an electrically-driven Sirocco centrifugal fan, which draws the air through the heater and discharges it, warmed to a suitable degree, into the building.

With the system of heating which will be installed in this Japanese Steel Works, no ductwork is required, which means a considerable reduction in the first cost of a plant of this character, as well as a decided economy of valuable space. Further, the running cost of this system is low, owing to the fact that the fans are not propelling the warm air through ducts, which latter, by setting up a resistance to the air current, increase the amount of power required to operate the fans.

In addition to the above-mentioned heating plant, the Japanese Steel Works have also ordered from Messrs. Davidson & Co. four Sirocco induced draught fans, 55 in. diameter, directly coupled to electric motors of the Lancashire Dynamo & Motor Co.'s make. These fans are to deal with the flue gases from two batteries of boilers in the same works.

Ozone Generators.

Messrs. Ozonair, Ltd., of 27, Chancery Lane, W.C., have added a number of new types to their series of ozone generators; two of these are illustrated herewith. Fig. 48 shows a small fixed pattern, suitable for workrooms, lavatories, offices, &c.; it can be fixed to the wall or ceiling, and is supplied either with or without a fan. A number of these generators can be worked in parallel from one

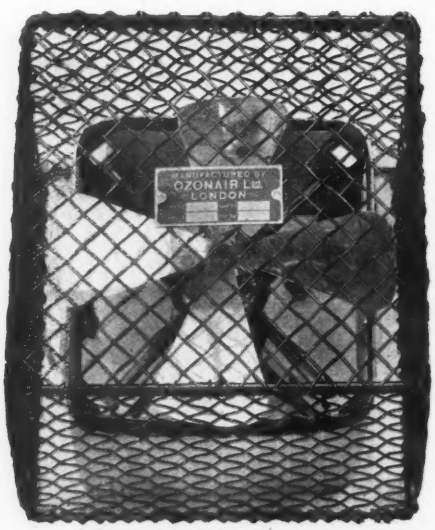


Fig. 48.—Ozone Generator, Small Fixed Pattern (Type 54).

transformer, a plan which has been frequently followed in practice; a single one takes 10 watts, but four in parallel take only 16 watts—of course, without the fan. One such generator is large enough for a room of about 2,000 cb. ft. capacity.

A larger generator is shown in fig. 49, the standard open-grid pattern for large installations; it can be made of any desired capacity, being built up of units connected up in parallel, and for an expenditure of one kilowatt-hour it is stated that 500 grammes of ozone will be produced at the concentration necessary for ventilating purposes. The same pattern when enclosed is suitable for manufacturing processes in which the ozonised air is required under control.

A large number of the Ozonair generators of various types have been installed in workshops, offices, hotels, &c.; in places such as fish markets, and hide and skin warehouses, where offensive odours

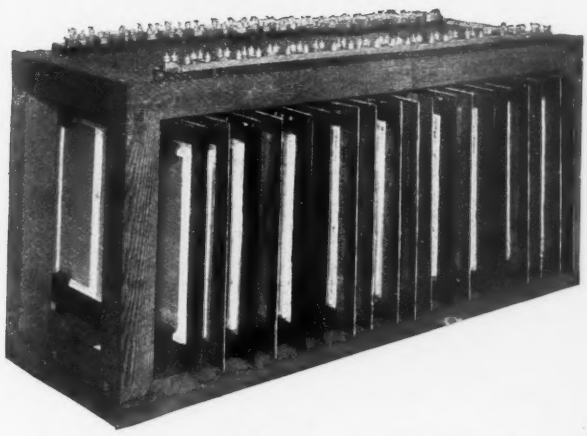


Fig. 49.—Open Grid Generator, 20 Units (Type 61).

are prevalent, the apparatus has been found especially beneficial. To meet the demand the makers have enlarged their works accommodation twice in two years, and have lately taken a large workshop in Camden Town.

Veritys' Manufactures.

Messrs. Veritys, Ltd., of London, Birmingham, Manchester, Glasgow, &c., are issuing to the electrical trade four new catalogues, and as these may be regarded as covering their latest manufactures, we refer to them in the following detail:—

Motors, Catalogue 560.—This catalogue, as also the arc lamp catalogue mentioned below, is got up in the form of a neat pamphlet of convenient size for the pocket (8 in. × 4 in.). The particulars it contains are very complete, all lamp details being given, as well as drawings, dimensions, weights and a great variety of useful information.

Messrs. Veritys are now placing upon the market a range of small machines from ¼ h.p. to 5 h.p., all made totally enclosed. But by improvements in design, and owing to the large demand, they claim to be in a position to supply totally enclosed motors at the prices usually charged for the same size semi-enclosed. Fig. 50 shows a

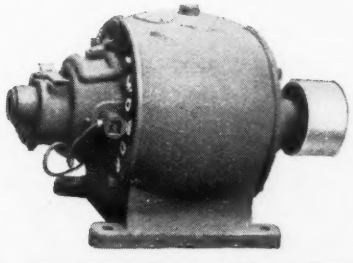


Fig. 50.—Verity Enclosed Motor (½ h.p.).

totally enclosed ½-h.p. motor. The 2, 3 and 5 h.p. sizes are similar in design except that the commutators are provided with side doors. It is worthy of mention also that the makers fit interpoles to these machines from 2 h.p. upwards. Fig. 51 shows a 40-h.p. "Aston" interpole motor of this firm's make. Messrs. Veritys have devoted considerable attention to the design of interpole motors, and their list shows very complete ranges and speeds under each frame number, as much as 5 and 6 : 1 speed variation being obtainable. Interpoles tend to reduce sparking and give exceptional facilities for speed regulation at the highest efficiency. The makers claim to be the first firm to supply motors of standard speed and for ordinary duty fitted with this improvement.

Fig. 52 shows an "Aston" motor coupled to a self-contained worm gear, the latter being provided with a capacious oil tank, in which by an ingenious arrangement a small pump draws cool oil from the bottom and projects it between the teeth of the worm and worm wheel at the moment of engaging. The catalogue also contains full particulars of the "Aston" starters, and a very complete

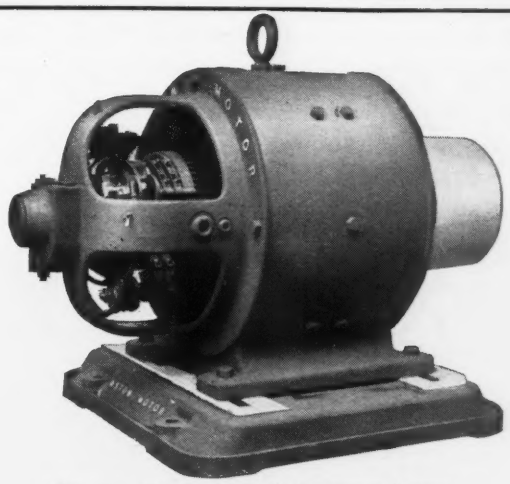


Fig. 51.—40-h.p. "Aston" Interpole Motor.

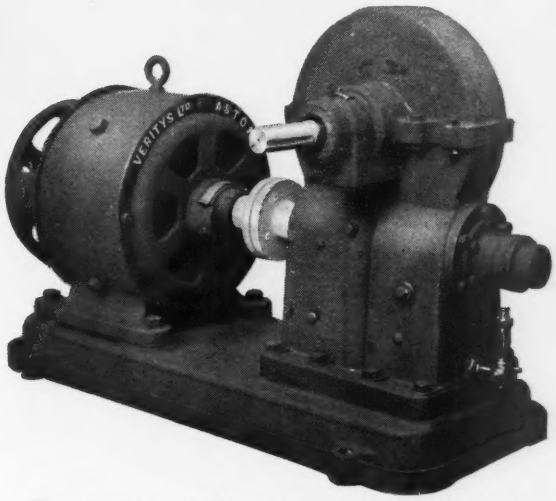


Fig. 52.—"Aston" Motor Coupled to Self-contained Worm Gear.

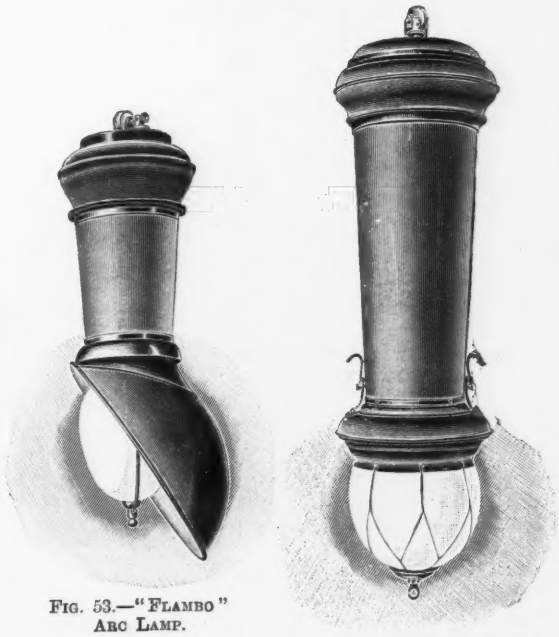


Fig. 53.—"Flambo" Arc Lamp.

Fig. 54.—"Flambolet" Arc Lamp.

table of shunt regulators for motors containing upwards of 200 sizes.

Arc Lamps, Catalogue 565.—This catalogue deals with the now well-known "Aston-Worsley" enclosed arc lamps, and also with the little "Monarco," which by all accounts is an extremely popular type. The "Flambo" (fig. 53) and the "Flambolet" (fig. 54) flame arc lamps are new features. The former is a flame lamp con-

structed for a current of 6 to 15 amperes, and the latter a Midget flame lamp, the sizes obtainable being 4, 5, or 6 amperes. In the 4-ampere flame lamp only 200 watts are absorbed as against 500 watts in the case of an ordinary enclosed arc lamp. This list includes spares, ornamental brackets, pillars, winches, weight-

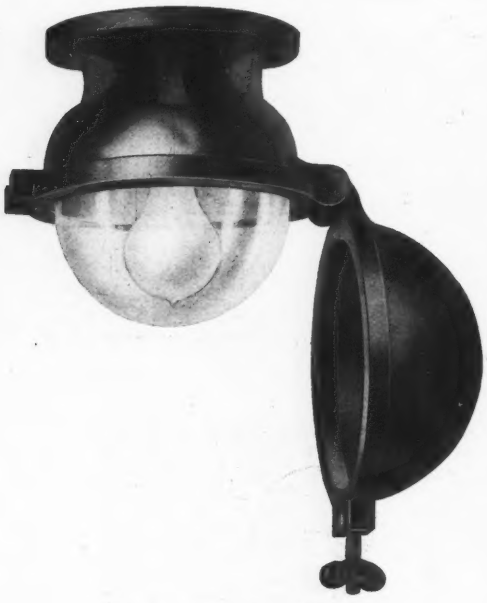


Fig. 55.—Bulkhead Fitting.

relieving contacts, &c., and throughout is replete with code words, weights and sizes, which should make the list of great convenience for the export as well as the home trade.

Ship and Engineering Fittings, Catalogue 563.—This is a fine quarto catalogue of fittings suitable for ships, mills, trams, railway carriages, and the like. Every description of cast-iron fittings is included. These are followed by brass and electro-plate ship fittings suitable for bulk-heads, 'tween-decks, cabins, saloons, cargo hatches, and the like. Fig. 55 shows a bulk-head fitting with massive cover suitable for closing when the hole is filled with cargo. A complete selection of tramway and railway carriage

Fig. 56.—Railway Carriage Bracket with Switch.

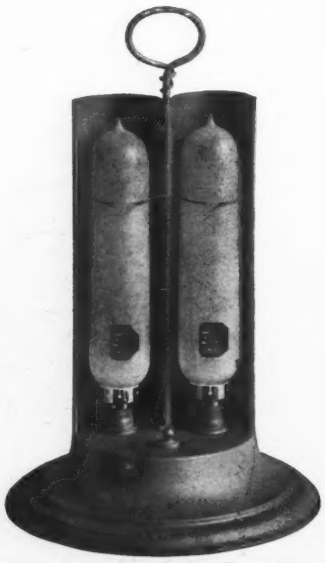


Fig. 57.—A Two-Light Radiator (Veritys).

fittings is included suitable for all types of cars. We note in the list a neat tramway roof fitting, and in fig. 56 a small bracket complete with switch for railway carriages.

"*Aston*" *Radiator, Catalogue* 567.—In addition to their most successful designs of last year, Messrs. Veritys have added several new and attractive designs of lamp radiators and also a complete range of wire-wound radiators. Fig. 57 shows a new design of two-lamp radiator for small rooms, offices, &c. A "Fan" type radiator for drawing rooms, &c., is also shown in the list, this and all other designs being listed in several different finishes. Fig. 58 shows one of the firm's wire-wound radiators. It is thought that for many purposes this type may supersede the radiant type, for it is claimed by the makers that, although the efficiency is approximately the same, the wire-wound radiator is more successful in establishing a current of air, cold air being fed in at the bottom and passing out thoroughly warmed at the top. For this reason it is held that a resistance type radiator will warm a room more rapidly than

Fig. 58.—A Verity Wire-Wound Radiator.

the radiant type, though, of course, it lacks the cheerful and glowing appearance of the latter. The wire-wound type is specially advocated for halls and for use on shipboard. Renewals which, however, are not frequently required, are all interchangeable and can be readily inserted in their places.

Westinghouse Lamps.

The British Westinghouse Co., of Trafford Park, have considerably extended their detail and supply department, in which are now included several interesting lighting specialties.

The Westinghouse tungsten filament lamp (fig. 59) is one of the metal filament lamps which threaten to become important competitors of the ordinary carbon-filament type. It is suitable for A.C. or D.C. circuits, and has the same length of life in either case.

Fig. 59.—Westinghouse Tungsten Lamp.

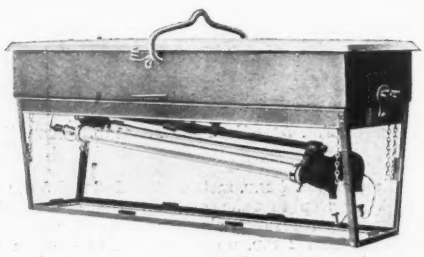


Fig. 60.—Cooper-Hewitt Mercury Vapour Lamp for Outdoor Service.

The advantages claimed for this lamp are a high average efficiency of one watt per candle-power, and a minimum life of 1,000 hours. As compared with the carbon-incandescent type, its efficiency is nearly 3½ times greater, and its power consumption less than one-third. For equal candle-power it is claimed to give an economy greater by 70 per cent., while its light is also of purer colour and the heat radiated is 70 per cent. lower. As before mentioned, the life

of the Westinghouse tungsten lamp, *i.e.*, the period during which the candle-power does not decrease more than 20 per cent., is 1,000 hours, but this, we are informed, can only be taken as a minimum figure, as users allege that in many cases the life has proved considerably greater. The Westinghouse Co. supply this lamp for single lighting in sizes of from 20 to 100 candle-power for 50 to 125 volt circuits. It is also adapted for series lighting.

The Cooper-Hewitt mercury-vapour lamp is already well known to our readers and calls for no further description. We understand, however, that the lamp is now supplied by the Westinghouse Co. for either hand or automatic tilting. In the automatic type the the tilting is performed by means of a solenoidal electromagnet and plunger. An automatic lamp for indoor service is shown in fig. 61 and one for outdoor service in fig. 60.

Flame and enclosed arc lamps for A.C. and D.C. circuits constitute a large part of the lighting business of the Westinghouse Co. Fig. 62 shows the Westinghouse D.C. flame-arc type. The lamp is of the brake-wheel class, and has a shunt and a series solenoid which act on cores suspended from the ends of a rocker. When the lamp is out of circuit, the tips of the carbons are apart, and they are only

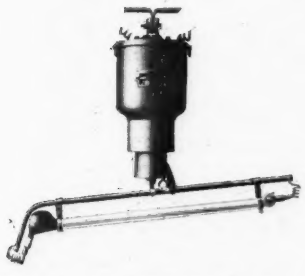


FIG. 61.—COOPER-HEWITT LAMP FOR INDOOR USE.

FIG. 62.—WESTINGHOUSE FLAME LAMP.

struck by the action of the shunt coil at the instant the circuit is closed. The carbon tips pass through two holes in the lower part of the lamp, one of these holes being in a movable plate, which is actuated, through a crank and levers, by a rocker upon which is mounted one of the contacts of the automatic switch. When the current is switched on, the movable plate slides inwards and draws the tips of the carbons together. The main circuit being thus established, the series coil tilts the rocker in the reverse direction, the plate is moved outwards, and the arc struck. The lamps have both horizontal and vertical feed, and are made for burning from 16 to 18 hours.

The company are also introducing a special double-carbon flame arc lamp for burning from 36 to 40 hours. The main advantage of the long-burning type is based upon the small attention necessary, as it burns considerably longer without re-carboning than the ordinary lamp.

Electric Sign Letters.

"Luciole" is the name given to an illuminated sign letter which is made of glass, and in colour and appearance is like snow ice. It has a full rounded surface with bevelled terminals to all ends,

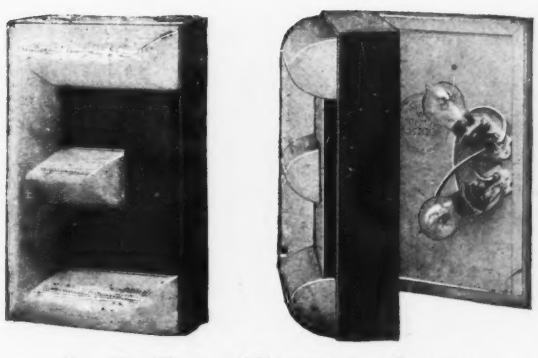


FIG. 63.—"LUCIOLE" ELECTRIC SIGN LETTERS.

so that by daylight it is well seen as it reflects the light at every angle, and altogether it is claimed to have a pleasing and unique effect. Its under surface is hollow, and the curves are such that a single 5-C.P. lamp is found to be sufficient to thoroughly illuminate every portion of an 8-in. letter, while only two of 5-C.P. are needed up to 12 in., and three from 12 to 16-in. letters. This is claimed by the makers to represent perhaps the greatest saving of current that has yet been introduced since illuminated letters have come into use. In the system of mounting, the lamp and holder are completely covered by the letter, so that there is no glare or shadow, and the entire depth of letter and sign-box need not exceed 5 in.

The rounded face of the letter only appears above the face plate, and it is said that the sign may thus be read at a much greater angle than with the ordinary facia or flush sign, or any front illuminated letter. Letters may be changed and new words produced without altering the lamps or in any way interfering with the focus of the light rays. The letters are made in 6 in., 8 in., 10 in., 12 in. and 16 in., and we learn that thousands of the signs are to be seen all over Paris, and some most effective, and at the same time, inexpensive examples have been supplied for a number of hotels and commercial houses in England by MESSRS. KRUPKA & JACOBY, of 61 and 62, Watling Street, E.C., who are the sole agents for Great Britain and the Colonies.

Induced-Draught Stoves.

MESSRS. O. C. HAWKES, LTD., of 69 and 70, Aldersgate Street, London, E.C., have made a special study of electric heating, and their latest catalogue of electric stoves contains numerous artistically-finished devices of this kind.

Special stress is laid on their patent induced-draught electric

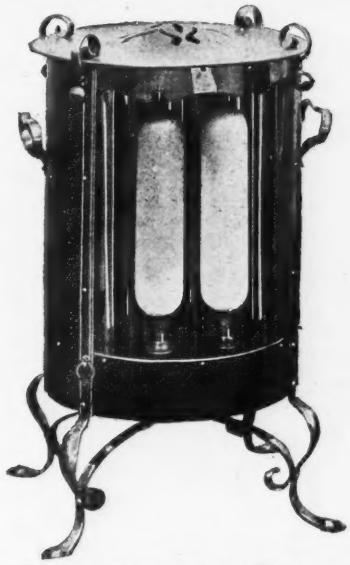


FIG. 64.—COMBINED CONVECTOR AND RADIATOR STOVE.

stoves, which are designed as air heaters, and rely upon the circulation of the air through the stove for their efficiency. The temperature inside this type of stove is over 600° F., which is more

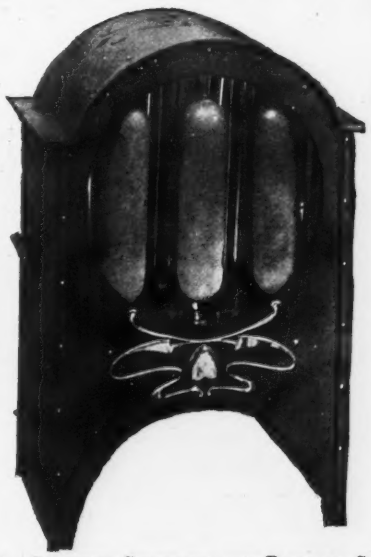


FIG. 65.—COMBINED CONVECTOR AND RADIATOR STOVE.

than enough to destroy bacterial life, and it is, therefore, efficient as a steriliser. A combination of the convector and radiator types of stove has recently been introduced by Messrs. Hawkes, of which two examples are illustrated herewith, figs. 64 and 65. These stoves provide for both direct and indirect heating; fig. 64 is in hand-wrought black

iron, with polished steel legs and ornaments, while fig. 65, similarly finished, has copper fittings.

Among other specialities may be mentioned ship stoves, garage heaters, these being recommended on account of their safety, meters for stoves, &c.

Electric Signs.

To those who have studied the question, it is conclusively evident that the electric sign has come to stay. Of course, there are signs and signs; a good novel sign almost does its own talking, and for

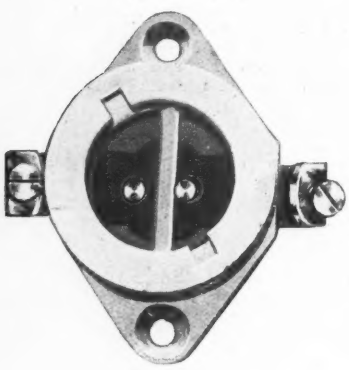


Fig. 66.

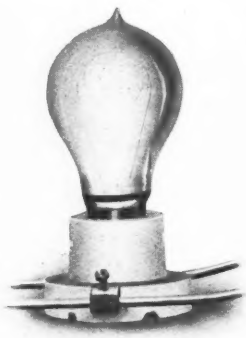


Fig. 67.

this reason it is well worth studying the matter closely, so as to ensure the adoption of the most suitable type under the given conditions.

In Messrs. Hawkes's very complete list of electric signs many excellent devices are portrayed, including interchangeable and

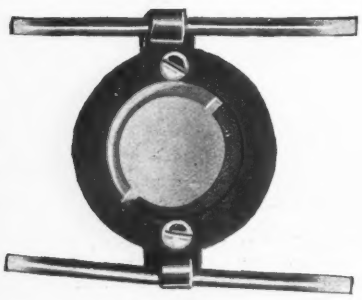


Fig. 68.

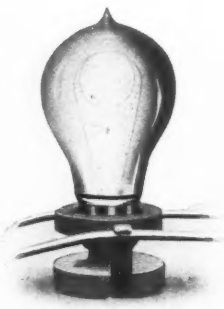


Fig. 69

crystalline letter and flash signs. One of the most adaptable of these signs is built up of interchangeable gilt wood letters, which are outlined by, preferably, low candle-power incandescent lamps. The latter are wired complete with lamp-holders (the lamps being wired in parallel) and are arranged to clip on to a bar iron frame.

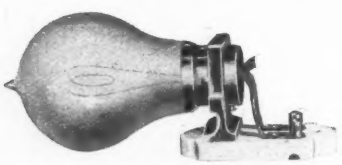


Fig. 70.

Several types of lamp-holder have been devised for the above and other signs; type A, of which two views are given in figs. 66 and 67, consists of a porcelain body which is countersunk into the wood letter at the back, so as to come approximately flush with the front surface. The metal terminals are substantially constructed to facilitate easy wiring.

Type B lamp-holder (figs. 68 and 69) is specially designed for temporary wiring for movable letter signs, wood and metal being employed in such a manner as to secure safety and cheapness. These holders are designed to slide along fixed wires. A further C type lamp-holder, also illustrated (fig. 70), has been specially designed for the interiors of signs. It consists of a porcelain base with a metal socket and spring contacts, and the lamps are placed in a horizontal position with no loss of space. This arrangement obviates the use of tubular lamps.

Messrs. Hawkes stock lamps for outlining wood letters of 2 c.p., and also supply vitreous or tinned-capped lamps, in order to withstand the corrosive action of smoky atmospheres.

Kryptol Heating Apparatus.

Messrs. W. F. Dennis & Co. have opened a showroom at their premises at 49, Queen Victoria Street, London, E.C., for the display of a variety of electric heating apparatus manufactured on the Kryptol system. As doubtless many of our readers are aware, Kryptol is a granular resistance material, which, intercalated

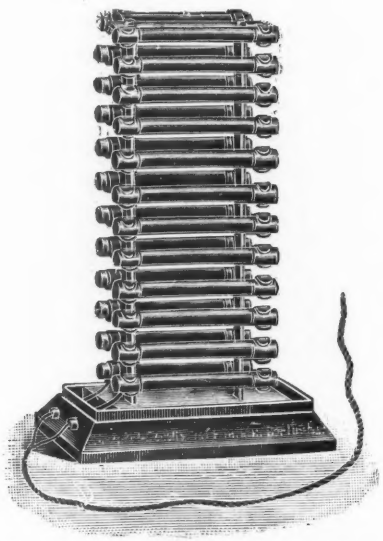


Fig. 71.—Normal Case of Kryptol Cartridges.

in an electric circuit, becomes hot and produces a temperature easily regulated and capable of exceeding 2,500°. The apparatus is filled, or stone or enamel plates are powdered with it, and according to the thickness of the layer of Kryptol and the intensity of the current employed, the desired temperature can be obtained; different temperatures can also be obtained in different places on one and the same surface. The material must be laid on without compressing it. It is stated to retain the heat well, rendering it unnecessary to use the electric current continuously for large apparatus. Among the advantages claimed is the avoidance of the use of resistance wire and metal plates, so that the heating mass cannot deteriorate, and costly repairs are thus dispensed with. The heating mass being composed of Kryptol granules only, can be replaced by anyone. Continuous or alternating current may be used.

A Kryptol electric stove or heater is made up as follows: (1) The case or frame for holding the Kryptol cartridges; (2) the Kryptol cartridges, which are special crystal tubes, closed at each extremity

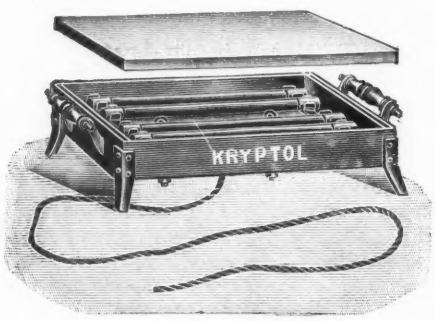


Fig. 72.

by metal capsules, which serve, at the same time, as electrodes; (3) the exterior cover, which can be made to suit the taste of the purchaser.

Fig. 71 represents a normal type of case furnished with these cartridges. The number of cartridges varies, and is calculated according to the size of the rooms to be warmed.

A minimum life of 3,000 hours for each Kryptol cartridge is guaranteed by the makers.

In fig. 72 we illustrate the loose Kryptol hot-plate, which can be used for a pressure of 250 volts and without a rheostat.

The consumption of current varies from 600 to 1,500 watts, according to the temperature desired.

The material is spread in a fine layer of from ½ to 1 centimetre (less than ½ in.) of thickness between the two electrodes. Non-insulated receivers, such as iron pots, can be placed directly on the bed of Kryptol, but it is preferable to use glass, quartz, or

Fig. 73.—Crucible Oven.

enamelled vessels. If the liquid in the vessel boils over, the working of the apparatus will not be impaired.

The temperature and consumption of the current can be regulated by the disposition of the layer of Kryptol. This apparatus is intended for laboratories, and for works and factories, but not for domestic purposes.

Fig. 73 shows a crucible oven. The crucibles are constructed of the best refractory earthenware, or porcelain. It is, nevertheless, recognised that there does not exist refractory earthenware, or porcelain, able to support for long the influence of the high temperature obtained by the electric current. This has led the makers to seek to replace the refractory products generally employed by another superior product, namely, quartz ($Si\ O^2$). The manufacture of small articles in quartz has been known

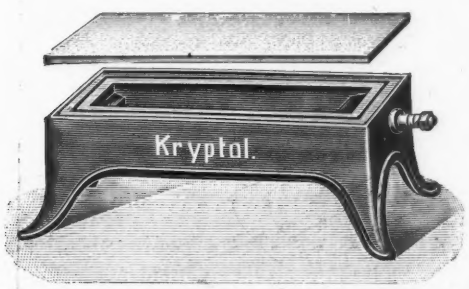


Fig. 74.—Cartridge Hot-Plate for Low Temperatures.

for some time, but the cost was so high that it was quite the exception for it to be used in laboratories. Muffles, crucibles, tubes, &c., are now made of cast quartz, the cost, having regard to the exceptional qualities which characterise this product being very reasonable. These muffles, crucibles and tubes in cast quartz, have the property of being insensible to the sudden variations of temperature. They are very difficult to melt, are proof against acids, and resist satisfactorily the action of Kryptol. It is also stated that in all temperatures they are but slightly permeable to gas.

Fig. 47 represents the Kryptol cartridge hot-plate for low temperatures. The temperature on the top of these is generally only about 60-70° Centigrades. This can be still further diminished by removing a certain number of cartridges (1 for 110 volts or 2 for 220 volts). The lids are made of red copper or of nickelled brass; for the small machines they are of pure nickel. The cartridges are in 10 in. and 13 in. lengths.

New Method of Wiring Portable Lamps, &c.

In the case of portable apparatus the risk of a failure or leak on the lamp-holder is always enhanced owing to the rough usage to which the flexible connection is subjected, and unless this is sufficiently protected it has to be frequently renewed. With the ordinary cast-iron pattern of hand lamp, in the event of a leak the handle becomes alive, so that the user may possibly be subjected to at least an unpleasant shock. The most satisfactory way to obviate this is to earth the hand lamp itself by putting it in direct metallic contact with the conduit run, and to facilitate this, Messrs. Simplex Conduits, Ltd., have introduced a special form of wall socket and connecting piece for use with metallic flexible tubing

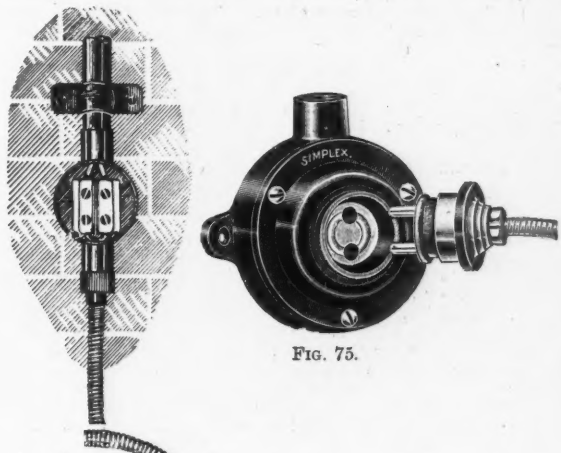


Fig. 75.

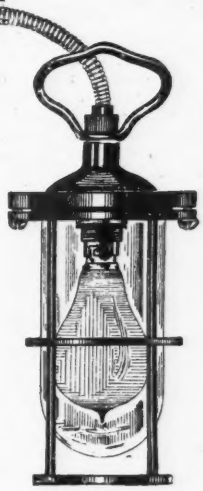


Fig. 76.

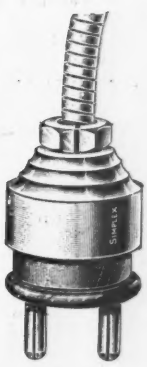


Fig. 77.

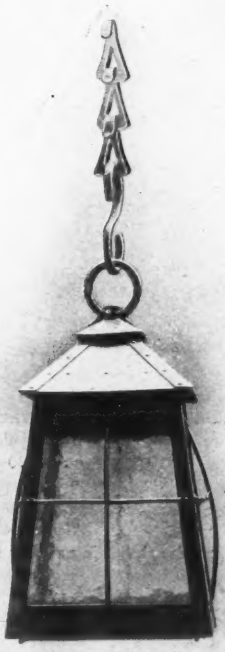


Fig. 78.—Antique Copper Hall Lantern.

(fig. 75). The illustration (fig. 76) shows the method of taking the connection from an ordinary inspection box provided with a porcelain interior. It will be seen that this has the double effect of providing a protection for the flexible wire—a decided advantage in workshop installations—and also earths the lamp-holder and hand lamp by making it electrically continuous with the main

conduit run. In the event of it being desired to employ the ordinary type of workshop socket, a special plug is made, fitted with a connector, as shown in fig. 77.

Full prices and particulars of connectors and tubing will be found in the company's current catalogue.

Messrs. Simplex Conduits, Ltd., are now making a number of electric light fixtures in polished or bronzed brass and copper or in oxidised silver. The illustration (fig. 78) shows one of their No. 9,163 types of hall or porch lanterns in antique copper, which is fitted with ambetti glass or real horn.

Illuminations at the White City, Manchester.

The Imperial Lighting Co., of 13, Gate Street, Holborn, W.C., to whose installation at the Irish International Exhibition, on the "Fairyland" system of illumination we recently referred, have also carried out for Messrs. W. P. Theerman & Co., electrical contractors, all the electrical illuminations, interior and exterior, for the "White City" at the Botanical Gardens at Manchester, comprising, up to the present, over 30,000 lights. We understand that the whole of this installation, including plant, was fitted up and ready for lighting in six weeks, which is believed by the above company to constitute a record.

The "Fairyland" strip was apportioned as follows:—Interior illuminations of the buildings, 10,000 16-c p. lamps with bayonet holders; exterior illuminations of the buildings, 20,000 5 and 8-c p. lamps with watertight holders.

For previous exhibitions and similar temporary lighting jobs it was not found necessary to have an absolutely watertight system, as the lamps could generally be so placed so as to hang downwards, besides which it is generally in use for a few months only, or during the summer, but in this case all the exterior illuminations will remain in position for a number of years, and it was, therefore, essential that a system of lighting impervious to rain, moisture and general atmospheric conditions should be employed. Anybody acquainted with the usual weather conditions prevailing in Cottonopolis will, therefore, realise that this was about as severe a test as could be devised.

By the beginning of next year additional buildings will be erected, when another 30,000 lights will be installed.

The consulting engineers were Messrs. Lacy, Sillar & Leigh.

Fig. 79.—Fairyland Illuminations at the White City.

Sperryn Tumbler Switches.

Messrs. Sperryn & Co., Ltd., of Birmingham, are introducing a new two-way tumbler switch of simple design. It consists of a porcelain base with four terminals and spring contacts equi-distantly arranged in the inner circumference. The dolly forms the upper part of a double-ended lever, the lower end carrying an insulated bridge piece. A pair of little rollers are attached to the lever and run on a specially shaped spring, which imparts a sharp make-and-break action to the switch. The device is substantially and well constructed.

The "Metalik" Lamp.

Messrs. G. M. Boddy & Co., of 18, Newington, Liverpool, are putting a metallic filament lamp (fig. 80) on the market, for which they claim a high efficiency, taking only 1·2 watts per c.p., and a useful life of 1,000 hours. It is claimed to give a pure white light—the nearest approach to daylight—and to burn with equal success on either alternating or direct current. The name of the lamp is the "Metalik."

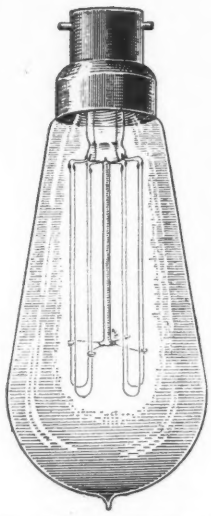


Fig. 80.—The "Metalik" Lamp.

Mercury Vapour Lamps.

The accompanying illustrations show two out of several types of mercury vapour lamps that are being introduced by Messrs. Isenthal & Co., of 85, Mortimer Street, W. These lamps are provided with incandescent lamps and relays, as shown; on closing the switch controlling the lamp, the incandescent lamps at once light up; the mercury vapour tube is then tilted by the pendant chain, and directly the vapour lamp lights up, the incandescent lamps are cut out by the relay in the casing at the top. Fig. 82 shows the M type, a workshop lamp, and fig. 81 the N type, an outdoor lamp. Amongst other types are photographic lamps, and a submersible lamp which is used on the Continent for chemical processes, advantage being taken of the ultra-violet rays. The effi-

ciency of the mercury vapour lamp for photographic purposes has recently been questioned by some of our correspondents; on the other hand, we are informed that they are being supplied to photographers in great numbers, and that uniform satisfaction has been reported on all hands. The only purpose for which the mercury lamp is unsuitable is blue-printing.

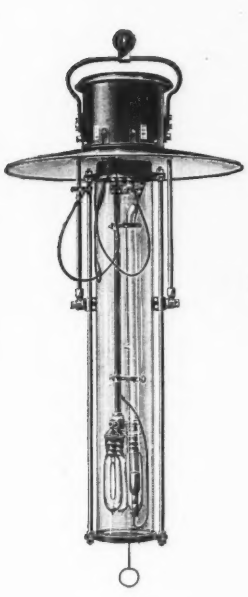


Fig. 81.—N-Type Outdoor Lamp with Relay.

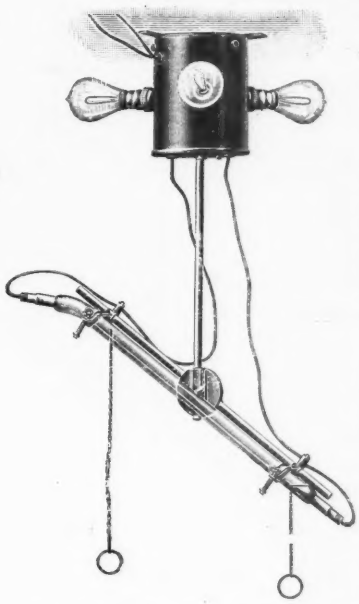


Fig. 82.—M-Type Workshop Lamp with Relay.

McGeoch's Switch Manufactures.

Messrs. W. McGeoch & Co., Ltd., of 28, West Campbell Street, Glasgow, are bringing their gas-tight switches and fuses before the trade in a new illustrated and priced leaflet just issued. These devices have been specially designed for colliery work and for use in exposed situations. The switch is of strong mechanical design to stand rough usage. The blade is claimed to break simultaneously from both contacts and to be dead in the "off" position. The sizes listed are for 15, 25, 50 and 100 amperes (600 volts). We give an illustration (fig. 83) of the double-pole fuses, which are included for the same sizes. We also illustrate (fig. 84) one of the firm's "Warwick" fuseboards for electric crane. This represents their standard type of switchboard, specially designed for this purpose, it consists of double-pole "A.B." switch and fuse, branch fuses milled head pattern, gravity amperemeter, spring controlled, pilot lamp bracket, with holder, all mounted on enamelled slates, with teak battens. The fixing holes are bushed with ebonite, and there is supplied a strong portable hand lamp with switch fuse plug and 10 yds. of workshop flexible. Among the firm's other specialties may be named a crane knock-off switch which is specially designed for use with overhead cranes to prevent the crane over-running a given point. It is mounted on a cast-iron frame with perforated sheet-iron backing, and switches are fitted with strong box spring release. They also make the "Warwick" double-pole power fuseboards suitable for 500-volt circuits (specially designed for use on power circuits) mounted on enamel slate slabs with bushed holes, with slate fillet and front connections, in a polished teak case. The "Warwick" removable fuse carriers are mounted on porcelain handles, so that fuses can be removed without shock to the operator. Cast-iron cases can be supplied either with holes bushed for cables or tapped for metal conduit. The firm also manufactures a line of marine distributing switchboards for ship installations, with combined single-pole switch and fuseboard for concentric or single wiring, and for carrying a capacity of eight amperes per way.

Within the next week or so Messrs. McGeoch will issue a catalogue of their latest patterns of ship's electric fittings, which will include all the principal types, and specially designed fittings suitable for public rooms and for private cabins. This catalogue will also contain most of the patterns of Admiralty electric lighting and bell material for warships, besides containing various selections of Newel figures, &c., for every class of ship work.

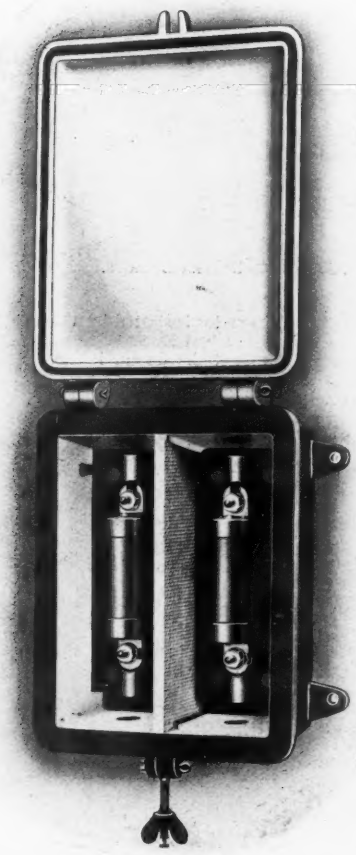


Fig. 83.—McGeoch D.P. Fuses.

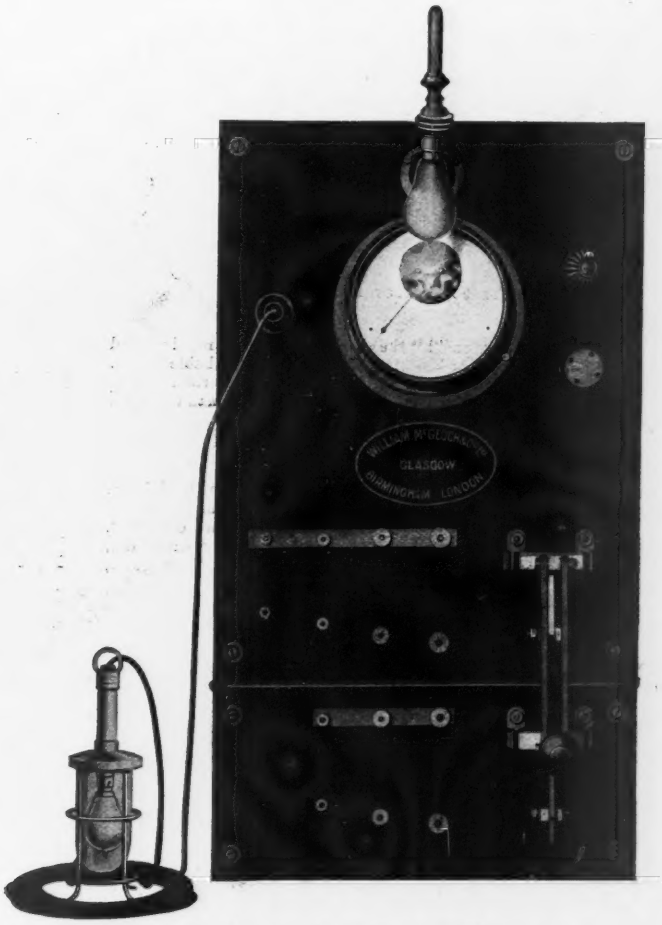


Fig. 84.—Warwick Crane Electric Fuseboards.

Electric Buffing Machine.

In fig. 85 we show a handy and reliable buffing machine suitable for watchmakers, jewellers, silversmiths, brass-finishers, and hotel proprietors, &c. It is manufactured in two sizes by Messrs. Electromotors, Ltd., Openshaw, Manchester—one suitable for silver or electroplate ware, and one for less fine metals, such as brass work, cycle fittings, &c. Two buffs are supplied with each set, a hard

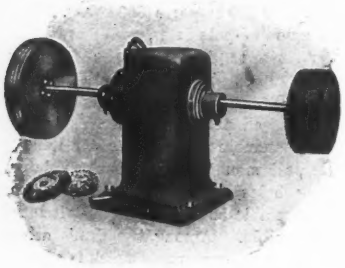


Fig. 85.—Electric Buffing Machine.

cleaning buff and a soft, fine polishing buff. For jewellers' work, however, special brushes can be supplied instead of the buffs. The machine is self-contained, and includes a starting switch. The power developed by these machines is respectively ¼ H.P. and ½ H.P.

Electric Horse-Clipper.

The latest adjunct to the stable is the electrically-driven horse-clipper, an illustration of which is shown in fig. 86. This machine also is manufactured by Electromotors, Ltd, of Openshaw, and consists of a specially-designed totally-enclosed dust-proof motor suitable for hanging on a beam. It is fitted with a flexible shaft

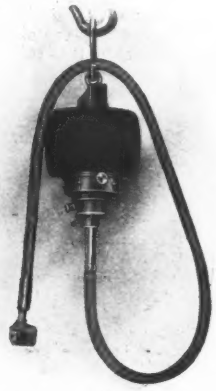


Fig. 86.- -Electric Clipper.

in an outer cover, which enables the clipper to be easily manipulated on the work. The clipper head is provided with detachable plates. Separate plates can be supplied suitable for sheep shearing. With this type of clipping machine it is possible for a man to clip a horse completely in 30 minutes.

Tool-Motors and Dynamos.

Messrs. Wright & Wood, Ltd., of Century Works, Halifax, have for some years devoted special attention to machine tool driving, they being in the centre of a large tool-producing district. The development of the variable speed motor for lathes, drills, &c., has produced a tool without belts, cones and almost without gears,

Fig. 87.—Variable-Speed D.C. Motor.

and the firm have successfully met the demand for such a motor by putting on the market a complete series from 2 H.P. upwards, with speed variation of 2 to 1 and 3 to 1. Higher speed variations can be obtained, but such are not often required. We show one of these motors (fig. 87), and we also illustrate their standard type of induction motor, single or polyphase type, with squirrel cage or slip-ring rotors, a line of which they are manufacturing up to 25 H.P. (fig. 88). Special attention is given to efficient ventilation, this being so important in order to ensure successful running. The slip-ring type is fitted with double carbon brushes, and is reversible. Other lines which are of interest to power users are their

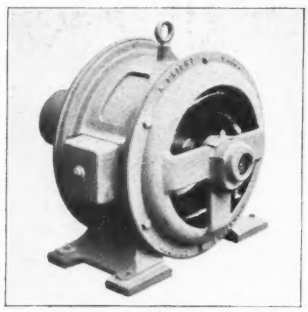


Fig. 88.—Induction Motor.

standard four-pole protected type dynamos and motors. These are being manufactured in sizes from ½ H.P. up to 25 H.P. In larger sizes than 25 H.P. an open type of dynamo or motor is considered desirable both for cool running and greater accessibility. The illustration, fig. 89, shows the firm's latest type of four-pole open type dynamo, with steel frame and three bearings, for belt drive. The armatures are former-wound, with balancing connections to ensure perfect commutation.

Another speciality recently put on the market by Messrs. Wright and Wood is a series of electric polishing lathes suitable for jewellers, brass-finishers, and light polishing trades, and having a

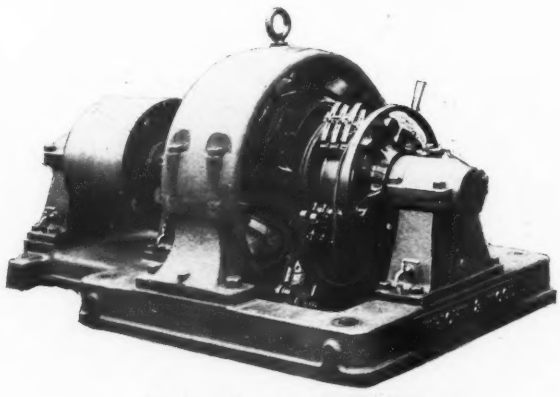


Fig. 89.—Belt-Driven Dynamo.

polishing buff at each end. The motor is started by a small handle at the top, the starting switch and resistance being contained in the motor case. A special feature of the design is that the whole apparatus is impervious to the dust produced by polishing, and all the parts are made as simple as possible.

Small Power Machines.

Some of the special lines of the Small Power Dynamo and Motor Co., of Old Lane, Openshaw, Manchester, are here shown. Fig. 90 represents their A.C. to D.C. transformer, which comprises an

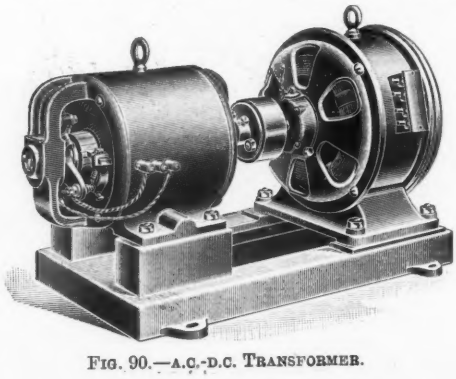


Fig. 90.—A.C.-D.C. Transformer.

A.C. motor coupled to a D.C. generator mounted upon a common bedplate. The machines are stated to be strongly and substantially built, and they can be supplied for any voltage and periodicity, and with various outputs at the generator end. The prices are claimed to be exceedingly low for a high-quality machine. In

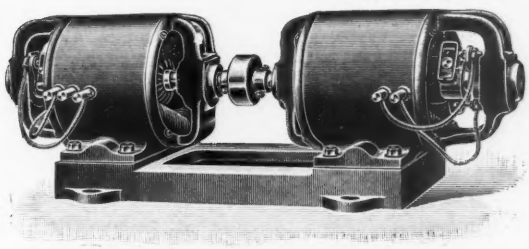


Fig. 91.—D.C. Rotary Transformer.

fig. 91 is shown the D.C. transformer, which is similar to the above, but for use on D.C. supply mains, while fig. 92 depicts the firm's D.C. motor which is wound for any voltage from 100 to 250 volts. The

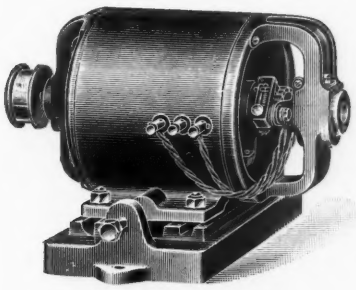


Fig. 92.—D.C. Motor.

same carcase is wound for small dynamos of any voltage from 4 to 250 with any suitable range of amperage. Price lists of either or all of these manufactures will be forwarded on application.

Silent Electric Organ-Blower.

The accompanying illustration, fig. 93, shows a simple organ-blowing apparatus which is made by the Kinetic-Swanton Co., Ltd., of Lincoln, the makers of the "Kinetic" blower. The "Aeromotor," as it is called, is of the centrifugal fan type, driven

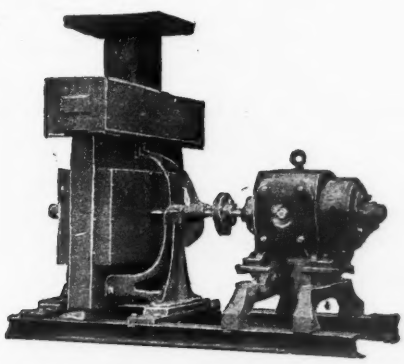


Fig. 93.—"Aeromotor" Organ-Blower.

directly by a small electric motor, and the special feature of the apparatus is its silent running, a quality which, it is stated, has hitherto been unattained. The means by which this result is secured is not explained, but is described as extremely simple.

Electric Capstans.

Messrs. Monte-Callow & Co., of Ipswich, have recently introduced to the English market a series of electric capstans, of French origin, of which more than 300 are in daily use on the Northern Railway of France alone. The capstans are both direct-acting and geared, and are suited to either direct or alternating-current circuits.

In both types of machine the supporting platform, with the capstan head above and motor below, swings on trunnions and can be rotated with a view to bringing the motor (and gearing, where it is employed) into a convenient position for inspection. The starting switch is situated in a small box casting, which projects from the side of the main casting.

In the case of the direct-current direct-acting type of capstan, the motor armature revolves in an eight-pole field, four of the field coils being shunt and four series. By varying the field connections, starting pulls of 1,300 or 2,240 lb. and working pulls of 900 or 1,760 lb. respectively can be obtained. The total absence of gearing allows this capstan head to be used as an intermediate live post, and to reverse without damage to itself or the operator.

Fig. 94.—Electric Capstan.

Where geared capstans are preferred, the armature spindle of the motor is extended to the top of the capstan head and revolves independently in bearings. A spur wheel on the spindle engages two intermediate wheels, which, in turn, engage an internally geared wheel fitted to the underside of the head.

The speed reduction is 6 to 1; this ratio allows the head to run free when the truck overruns the capstan, thus avoiding shocks to the rope or machine.

The capstan will automatically stop with a pull of 1 ton; the motors of the direct-acting type can remain stationary, if pulled up by the load, for 10 minutes without damage. The starter or controller consists simply of a D.P. quick-break knife switch fitted with magnetic blow-out, and actuated by a spring-controlled foot pedal.

The maintenance of these capstans is stated to be very small, and their utility can be judged from the fact that many of them have been in daily use for the past 19 years.

Screws and Terminals, &c., for Electrical Work.

Messrs. Davis & Timmins, Ltd., whose name ranks among the oldest in the electrical industry of this country by reason of their specialised work in screws and terminals and so forth, now devote the whole of their York Road, King's Cross, premises to office work

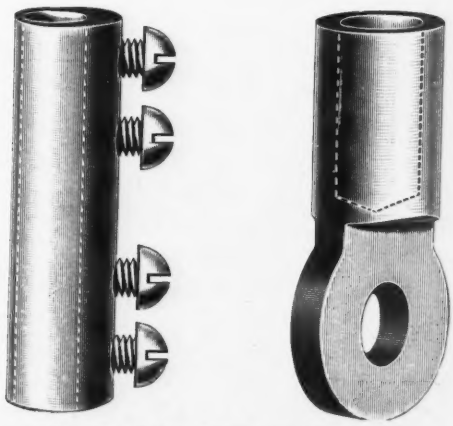


Fig. 95.—Cable Connector and Socket.

exclusively. All manufacturing operations are carried on at the works which were recently erected at Wood Green; these are now in full running order, and are electrically driven throughout. The installation consists of a Dowson gas producer plant, and a Westinghouse gas-engine-driven set of about 150 nominal H.P. By the aid of this electrical plant and with a greatly extended works accommodation the firm has far greater facilities for the prompt handling of orders for screws, nuts, ter-

minals, bolts, studs, contacts, plungers, &c. A few of their latest lines we show in the accompanying illustrations, and it may be added that these and similar articles are stocked in practically end-

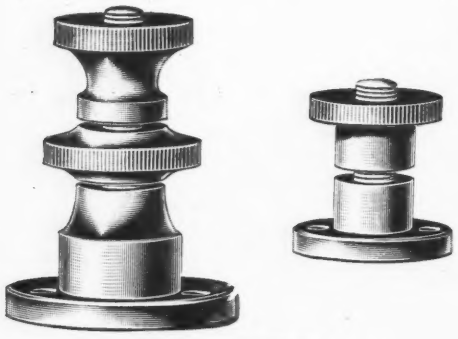


Fig. 96.—Terminals.

less variety to suit the requirements of central electric lighting stations and the electrical trade generally.

The firm has a new catalogue in course of preparation, and this will appear in the course of a few months.

Electric Power in a Paint Works.

An installation of electric motors has recently been fitted by Messrs. The Langdon-Davies Motor Co., Ltd., of Southwark Works, Deverell Street, S.E., in the factory of the Suter Hartmann and Rahtjems Composition Co., Ltd., Silvertown, which is of special interest, because, owing to the presence of explosive gases in the works, the whole of the motors, lamps, switches and fuses had to be enclosed in gas-tight casings. Power is supplied from the mains of the Poplar Borough Council, at 220-220 volts D.C., and is brought into the works by steel-armoured rubber-insulated cables, cleated to the walls. The main switchboard is of marble slabs in an iron framework, with teak facings, and the main switches are of the Berry enclosed switch-fuse type, operated from the front of the board by pull-rods and levers; fig. 98 shows the back of the switchboard.

The lighting and power cables are enclosed in steel conduit, and the lamps, of which there are 250, are double-enclosed to prevent access of gas.

The motors are completely enclosed, as shown in fig. 99, which represents a 35-H.P. motor driving mixing machinery, and they are controlled from separate switchboards, one of which is illustrated in fig. 97.

The whole of the switchgear is enclosed gas-tight; it consists of main switch and fuses and field regulator, mounted on a slate slab, with the motor starter below, stuffing boxes being provided where cables and spindles pass through the casing to exclude gas. Besides the main machines, which are driven in groups, a 3-ton hoist is driven by a 17-H.P. motor, and various small machines in the laboratories are motor-driven. Fig. 100 shows a set of paint mills, mixers, &c., driven by belt from a motor.

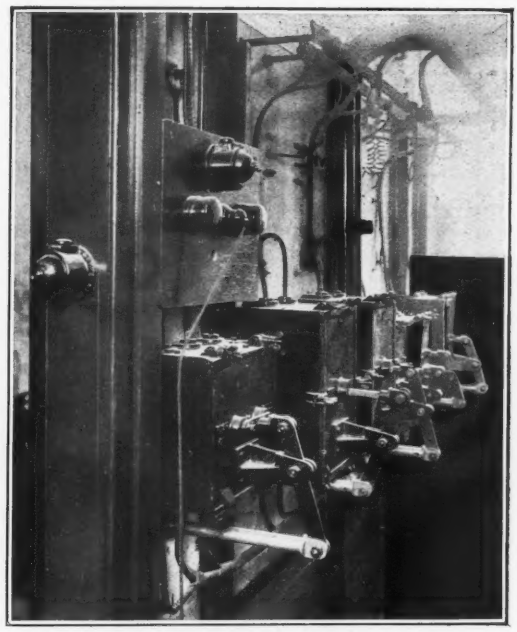


Fig. 98.—Back of Main Switchboard.

Fig. 99.—Langdon-Davies Enclosed 35-H.P. Motor.

Fig. 97.—Motor-starting Panel with Gas-tight Switchgear.

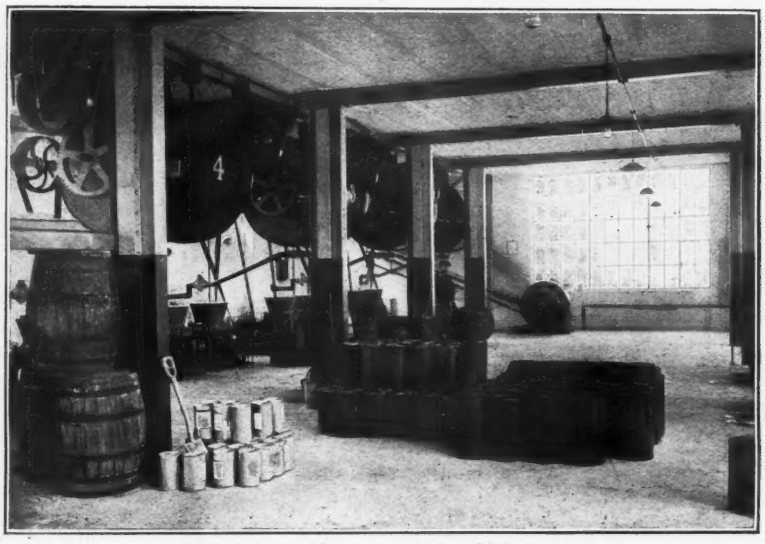


Fig. 100.—Motor-driven Paint Mills.

Bailey's Air Compressor.

In fig. 101 we show a "Köster" air compressor of the vertical single-stage type, driven direct by an electromotor, as supplied by Messrs. W. H. Bailey & Co., Ltd., Salford, Manchester. It is said to be the smallest direct motor-driven machine of the type made, and it is capable of delivering 12 cb. ft. of free air a minute, and compressing it to 90 lb. per sq. in. It is suitable for operating compressed-air brakes on electric trains, also for cleaning dynamos, &c., in power stations, and many other purposes where extreme compactness and portability are required. It is fitted with the "Köster" patent piston-valve gear, which enables it to run

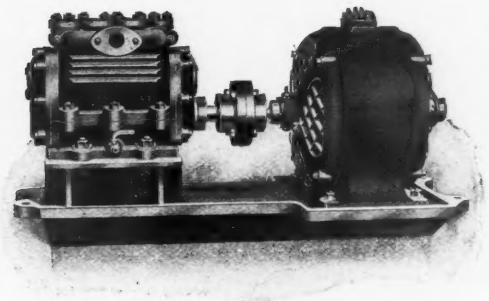


Fig. 101.—Koster Air Compressor.

smoothly and efficiently at a speed of 1,000 r.p.m. The motor and compressor are mounted on one bedplate.

Tapping Machine.

A handy machine for tapping small holes, called the "Rapid" thread-cutting machine, has been marketed by Messrs. G. Straus and Co., Ltd., of 211, Upper Thames Street, E.C. Fig. 102 shows the smallest size (type G.S.); larger sizes are also made. The machine illustrated is suitable for tapping holes up to ¼-in.

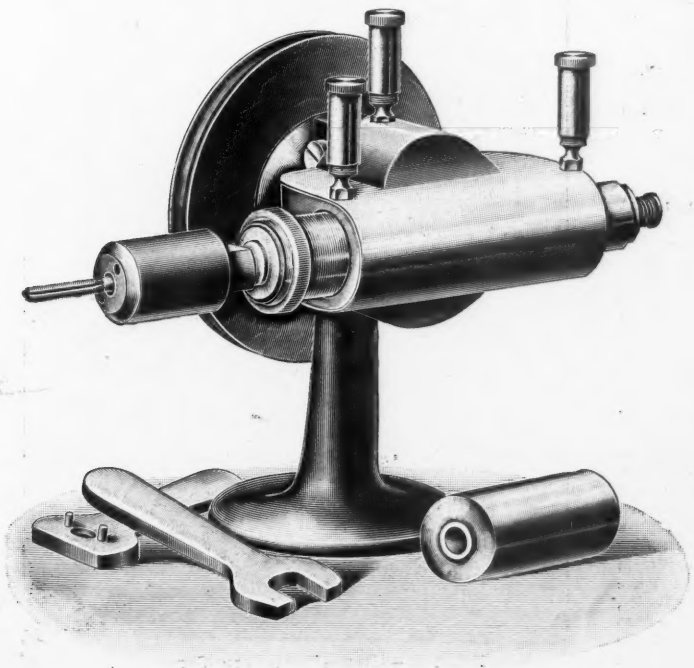


Fig. 102.—"Rapid" Thread-Cutting Machine.

diameter, the drilled pieces to be tapped being simply held against the tool by hand, without mechanical feed. The pressure brings the spindle carrying the tap into gear with the driving mechanism, thus starting the operation; directly the tap has entered far enough, the work is gently drawn backwards, when the tap stops, starts in the reverse direction at double speed, and is quickly withdrawn from the hole. As the reversing is automatic, both hands may be used to hold the work. To prevent injury to the tap when it is short, or when the hole is not bored through, an adjustable collar is provided which limits the travel; when the work meets this collar, the spindle reverses automatically. The machine can also be used for cutting outside threads, a die-holder being supplied for this purpose. Larger machines are made, with additional devices for centring the work and holding it truly vertical, for sizes up to ½-in. diameter.

Besides these machines, Messrs. Straus are agents for the Weinert arc lamps and the Fafnir petrol engines, both of which have been described in our columns; and they have recently taken up the wolfram metallic filament lamp, which has a useful life of 1,000 hours, and an efficiency stated at 1 watt per candle, and is suitable for alternating current as well as direct.

Howard Asphalt Troughing.

Although nothing really new can be said of this unique method of cable laying, its continued popularity, as shown by the lengthy list of users, is ample evidence of its success.

The system is based on one insulating material throughout:—Bitumen asphalt trough and cable separators; bitumen filling; and asphaltic concrete cover. Jointing and bending are simple matters; when laid the troughing affords the best protection against electrolytic action, and is perfectly watertight. Owing to its splendid insulating properties, it affords an excellent method of relaying old rubber cables, which might otherwise be practically useless.

The "Cryselco Radiant" Lamp.

The Cryselco Co. is manufacturing at its Bedford works a metalised carbon filament lamp, which is guaranteed equally satisfactory on alternating or direct current.

A 20-c.p. lamp, taking 45 watts, is suitable for pressures of 100-115 volts, and a 25-c.p. lamp, taking 60 watts, for pressures of 200-250 volts. The company also supplies the "Alfamegga," "Perfect," and "Cryselco Variable" lamps.

Statter Time-Lag Relays and Circuit-Breakers.

The Statter patent time lag, which has been described in our pages, has been considerably developed during the last few months. It can now be supplied by the Switchgear Co., Ltd., of Newhall Street, Birmingham, to fulfil the following conditions:—It can give a lag varying from several minutes in the case of small overloads of 15 per cent. or 20 per cent., to action which is so nearly instantaneous as to be unmeasureable at overloads of 300 per cent. or 400 per cent. A modified form will, however, give a lag which, varying as in the previous case from several minutes at small overloads, never becomes instantaneous, but always preserves a small interval of time, the curve of lag being in this case asymptotic to

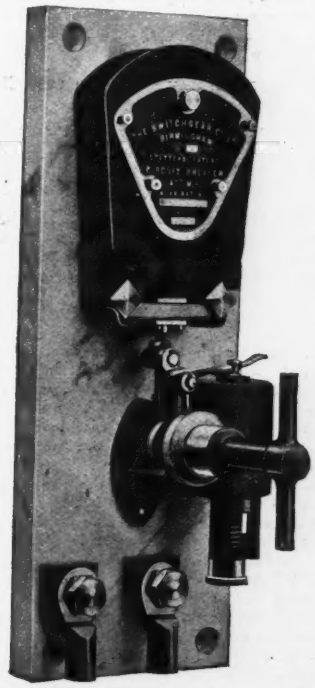


Fig. 103.—Statter Time-Lag Circuit-Breaker.

the axis of overload, a matter of great importance in the case of a central station network. The appliance can be fitted to any automatic device depending upon solenoidal attraction for its operation, and it can also be arranged as a separate relay to operate a solenoid.

Our illustrations show two types of time-lag circuit-breakers which have been comparatively recently introduced by the Switchgear Co. As in all the circuit-breakers made by this firm, they are of the free-handle type, that is to say, it is impossible to hold the breaker in on an overload. In the type illustrated in fig. 104 (p. 518), when the breaker has been closed the handle is locked in the down position, and the breaker can only be tripped by the hand-tripping gear. Fig. 104 also shows the Sugden and Rodway patent reverse relay, which can be fitted to most ordinary forms of circuit-breaker. One of its leading advantages is that it will act properly in the

case of a sudden heavy reversal, such as, for instance, would be produced by a switchboard attendant accidentally switching-in a standing generator; in most forms of reverse relay the enormous rush of current would reverse the polarity of the permanent or shunt excited magnet before it had time to move, and consequently would fail to trip the circuit.

In the breaker shown in fig. 103 the reversal of the handle does not affect the brush until the handle has passed through a considerable arc, at which point it operates the tripping gear. These particular breakers have the advantage of lying flat, and are, therefore, convenient for use in cases where it is necessary to box

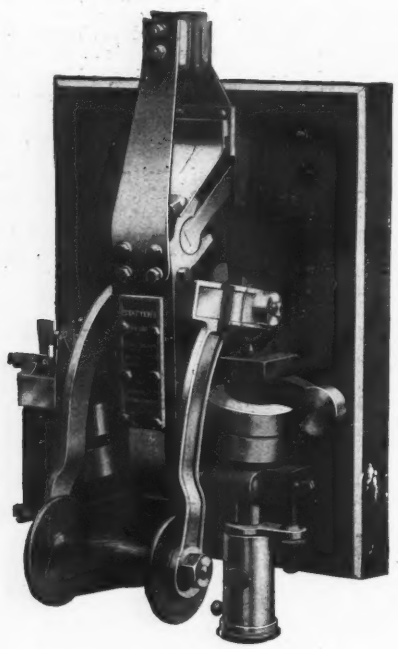


Fig. 104.—Circuit-Breaker Fitted with Reverse Relay.

the switchgear in. Several of these have been supplied to the Admiralty for use in this way.

High-Efficiency Lighting Units.

Messrs. C. C. Collins and A. N. Cope, of Columbus, Ohio, in a report made at the Ohio Electric Light Association Convention, August 21st, gave the results of answers to a number of questions sent out to central station companies in the State regarding the use of new high-efficiency electric lamps of various kinds. The compilation covers answers from 19 companies. The "flaming" arc lamp is used by 15 of the 19 companies, but its use is very restricted, being equal to only 38 kw. The magnetite lamp is used by two companies for street lighting. Its adaptability is shown by the satisfaction which it is giving and by the extremely low rates secured by cities using it. The Cooper-Hewitt lamp is used by five of the companies, its use being limited to photograph galleries, printing offices and machine shops. No Moore tubes are in use. Twelve companies are using the Gem lamp. This lamp seems to be in very general use. Two companies are using the tantalum lamp. One company is using the tungsten lamp. The Nernst lamp, like the Gem, is in very general use, 11 of the 19 companies using it. The average number of glowers per lamp is three. The replies indicate that we may expect a life from magnetite lamp electrodes of 180 hours; from the Gem lamp of 500 to 600 hours, and from the Nernst lamp 600 to 700 hours. Seven companies of the 19 are using a 3·5-watt carbon filament lamp, due, in the majority of cases, to poor regulation of voltage. Every company replying states that an increase in revenue has been noticed after introducing high-efficiency units. It is very evident that business has been secured which could not have been got in any other way. The replies in regard to voltage regulation are very vague, and indicate that sufficient attention is not being given to this most important factor. —*Electrical World.*

Sandycroft Electrical Mining Apparatus.

A few of the specialities of the Sandycroft Foundry Co., Ltd., of Chester, which are of particular interest just now, are described below.

"*Hunt*" *Induction Motors.*—Some months ago we published an abstract of an I.E.E. paper by Mr. L. J. Hunt, on a new induction motor capable of running at various speeds;* the manufacture of this motor has been taken up by the Sandycroft Foundry Co., Ltd., who find them particularly suitable for colliery and mining work, owing to the absence of slip-rings. The machine is built in three types, of which the simplest type has a short-circuited rotor without slip-rings, the speed in this case being regulated by resistances in the stator windings. Full-load starting

Fig. 105.—"Hunt" Variable-Speed Induction Motor.

torque is developed with full-load current, and larger torques in proportion. Another type has a double-wound rotor with three slip-rings, and runs at two speeds without losses in resistances, intermediate speeds being obtained by rheostatic regulation. The efficiency at both speeds is high, and the power factor is but little reduced at the lower speed. This motor develops full-load torque with only 0·7 of full-load current, and starts with 1·45 times that

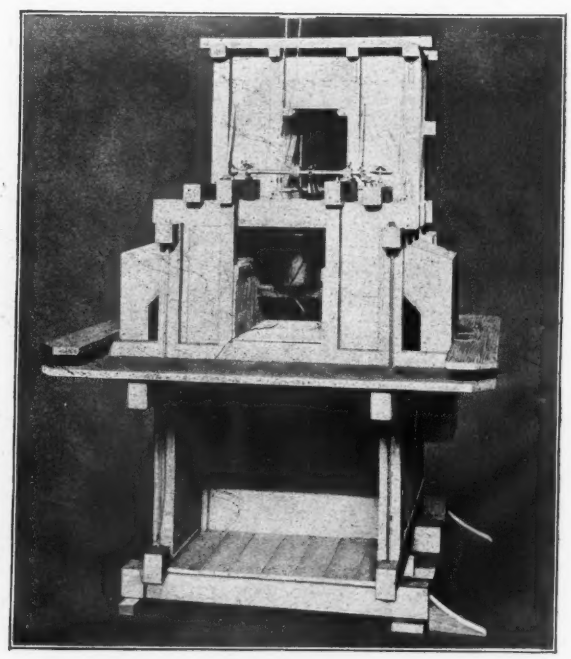


Fig. 106.—"Dawes" Magnetic Separator.

torque with full-load current, or double torque with 1·4 times full-load current. A third type is made with a change-over switch in the stator circuit, giving three speeds with high efficiency. The designs have been standardised from 5 to 200 B.H.P., at various speeds, for 50 and 25 cycles. The accompanying illustration, fig. 105, shows one of the "Hunt" motors.

A special feature of the company's designs is the low speed attainable; for instance, a three-speed motor for driving an induced draught fan is wound for 50 cycles, and gives 25 B.H.P. at 720 R.P.M., with proportionately reduced outputs at 480 and 290 R.P.M., these speeds corresponding respectively to 8, 12 and 20 poles. Similar motors with 20 poles are made down to 10 H.P., and 12-pole machines to 5 H.P.

Magnetic Separator.—An application of electricity to the mining and metallurgical industries, which has been developed by the company, is a magnetic separator made under the "Dawes" patents, and specially designed for the separation of complex ores.

* Electrical Review, May 10th, 1907, page 782.

It has been used successfully, not only for mixtures containing iron and steel, but for more feebly magnetic substances, as in the separation of certain ores of copper and zinc, tungsten and tin, &c. The machine, in its simplest form, consists of a horse-shoe magnet, wound for very high magnetic densities. Between the poles of this magnet rotates a drum, and above the latter, and with its axis at right angles to it, a disk is mounted and driven at a high speed. The material to be separated is fed on to the drum, and is carried by it between the poles of the magnet. Owing to the arrangement of the poles the magnetic material flies up from the drum on to the under side of the disk, and is thrown by it into a hopper provided for its reception. The non-magnetic material is carried round by the drum and deposited in another hopper. A view of the complete apparatus is given in fig. 106, page 518.

Automatic Air-Compressor Switch.—This apparatus, fig. 107, is an adaptation of the well-known "Woolliscroft" liquid starter to the automatic control of motor-driven air compressors, and is actuated by the variation in air pressure between given limits, so that when the pressure in the receiver rises to the maximum value the current is cut off and the motor stopped; again, when the pressure falls to the minimum value the motor is gradually started up. The air pressure acts upon a piston in a small cylinder, which is counterbalanced by a weighted lever. The movement of this lever opens and closes a small carbon contact switch, which energises a solenoid when closed. The solenoid in turn acts upon a balanced valve of the piston type, which admits air on one or the other side of the double-acting cylinder operating the controller.

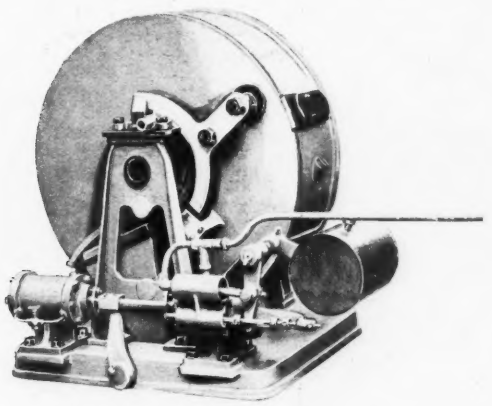


Fig. 107.—Automatic Air-Compressor Switch.

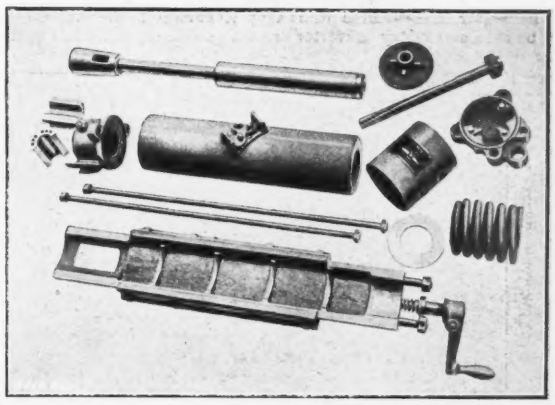


Fig. 109.—Component Parts of Rock Drill.

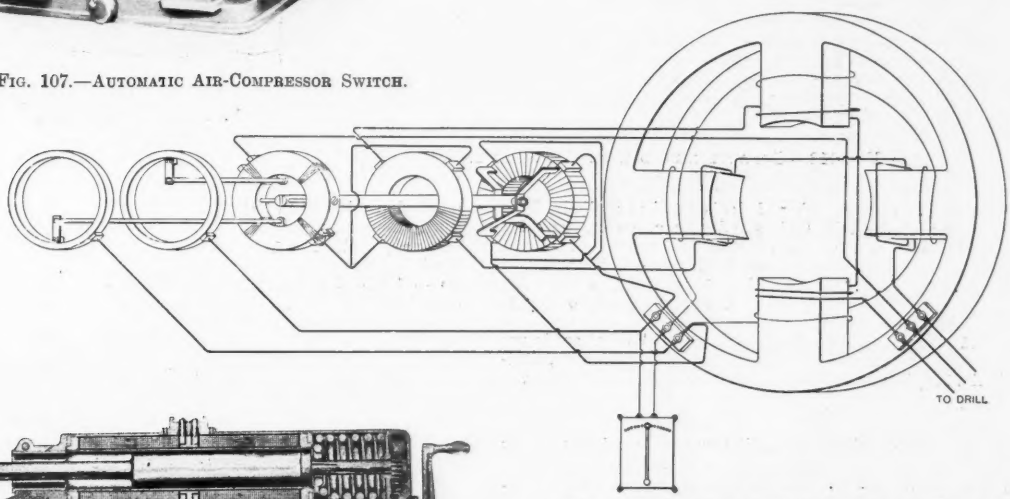


Fig. 110.—Diagram of Connections of Generator.

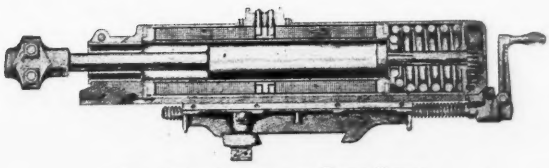


Fig. 108.—Section of Rock Drill.

Fig. 111.—Marvin-Sandycroft Electric Rock Drill.

The speed of cutting-out resistance is regulated by an improved oil dash-pot, and can be set for anything from a few seconds to a few minutes.

The object of the solenoid is to provide a no-voltage release, so that on a failure of the supply the switch returns to the off position, and restarts the motor on the supply being renewed.

If a no-volt action is not required, the balance piston acts directly upon the valve instead of through the agency of the solenoid and switch. Owing to the absence of any likelihood of sticking, or possibility of burning out, the advantage of the liquid switch for automatic work is obvious.

The switches have been successfully used for air compressors, for rock drilling in mines, pneumatic signalling and the charging of air reservoirs for the pneumatic braking of tramcars, and can be adapted for continuous or alternating-current motors

Marvin-Sandycroft Electric Rock Drills.—These drills are of the double-solenoid percussive type, and are made to stand the severest mining conditions. They are very simple in construction, and can be taken apart and reassembled in less than five minutes; as all the parts are interchangeable, a broken part can be replaced at the working face without the necessity of removing the drill to the repair shop, there being no joints to make or glands to pack.

The drill has but two moving parts, viz, the plunger, a solid steel forging reciprocated by the alternate attraction of the two solenoids, and the rifled bar which causes the partial rotation of the plunger at each upward stroke.

The coils are enclosed in a steel case, and insulated by mica only, and therefore cannot be burnt out. The wire is of square section, and is fed in by a special process, the whole forming a practically

solid mass of copper and mica, which is then caulked in a strong solid-drawn steel tube. The drill is shown in section in fig. 108, and taken to pieces in fig. 109.

That there has not been a single instance of a coil breaking down during the five years that these drills have been in operation in this country is sufficient proof of the reliability of this process.

There are no sliding contacts on the drill, the shifting of the current from one coil to another being performed entirely by the generator. The machine which supplies current to the drill can either be used as a rotary converter or as a generator, but when used as a rotary converter twice the number of drills can be supplied. This machine is one of the S.F. Co.'s standard D.C. generators with an extended shaft which carries an arrangement of slip-rings and commutators designed and patented by Mr. T. M. Dutton, and shown in fig. 110, p. 519. The principal feature of this apparatus is that although a four-pole machine is employed, only one cycle is produced per revolution.

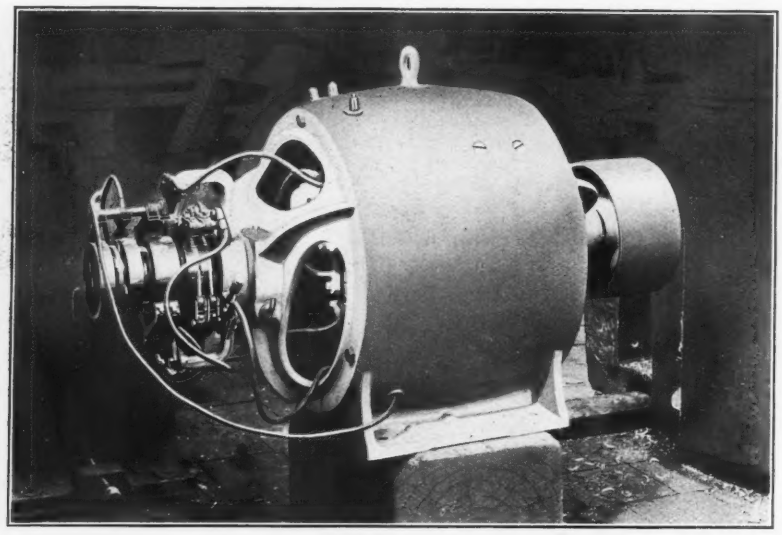


FIG. 112.—GENERATOR USED WITH ROCK DRILL.

In fig. 111 we show one of a number of these drills that are in use at the Buxton Lime Firm's Works. The standard generator, illustrated in fig. 112, is used for lighting purposes as well as driving.

Electrical Pyrometers.

A complete series of direct-reading pyrometers has recently been brought out by MESSRS. CROMPTON & CO., LTD., of Salisbury House, London Wall, E.C. The principle on which these instruments depend is that of the thermo-electric couple, connected with a suitably calibrated indicator of the moving-coil type, no battery being required. Fig. 113 shows a complete pyrometer connected up; the indicator is also made of the edge-wise type. For temperatures up to 1,100° C. the couple is composed of a nickel rod inside a steel tube, the two being welded together at one end, and provided with terminals at the other; for lower temperatures—up to 500° C.—a constantan-copper couple is used. Special forms are made for different applications; fig. 113 shows a long pattern, suitable for testing flue gases or furnace gases, while fig. 114 shows a short plug pyrometer for screwing into a steam pipe. A portable set is also made. Fig. 115 shows the connections; the terminals are marked N and S respectively, and the leads are of nickel and steel, so that the materials forming the couple are continuous up to the indicating instrument; very slight insulation is required between them. As the cold junction is at the indicator, and is not always at the same temperature, it is necessary to provide corrections; this has been accomplished by attaching a thermometer to the indicator, and constructing the scale in the manner shown in fig. 116. The several arcs are calibrated at different temperatures of the indicating instrument ranging from 10° to 30° C. in steps of 5° and the reading should be taken on that arc which corresponds

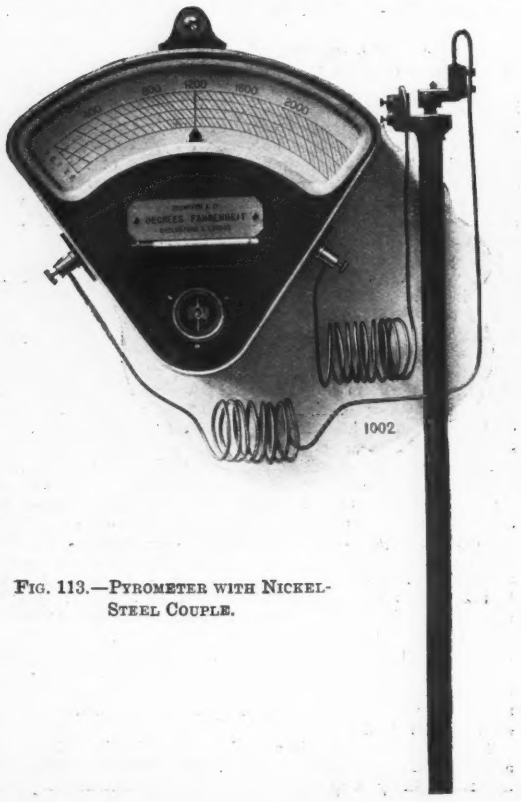


FIG. 113.—PYROMETER WITH NICKEL-STEEL COUPLE.

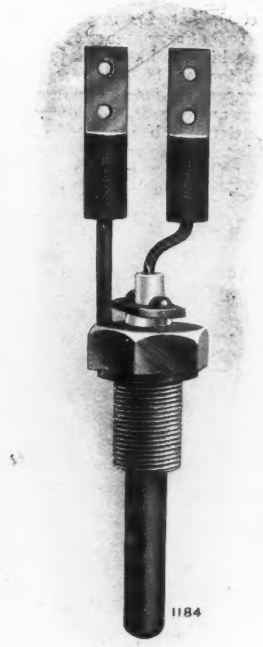


FIG. 114.—SHORT PATTERN PYROMETER FOR STEAM PIPE.

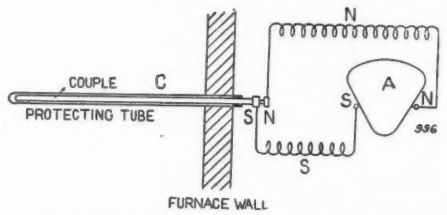


FIG. 115.—CONNECTIONS OF NICKEL-STEEL PYROMETER.

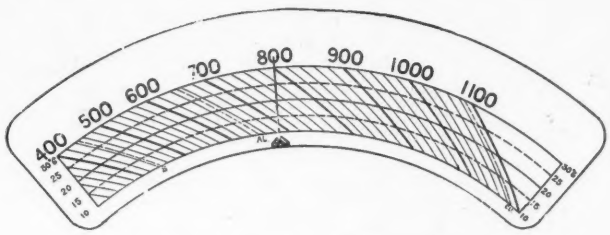


FIG. 116.—SCALE OF INDICATING INSTRUMENT.

with the thermometer reading. It will be noticed that the melting points of sulphur, aluminium and copper are specially marked on

Fig. 117.—Case-Hardening Furnace with Pyrometer.

the scale for the purpose of checking the readings. Fig. 117 shows the apparatus in use in connection with a case-hardening furnace.

Drake & Gorham's Switchgear.

Messrs. Drake & Gorham, Ltd., are now busily engaged in manufacturing for the trade switchgear of every description at Felix Street, Westminster Bridge Road, where their works are situated.

This firm has a number of specialities, amongst these being its

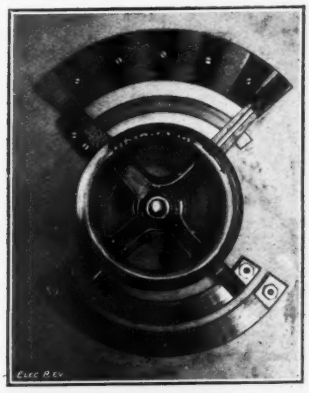


Fig. 118.—Battery Regulator.

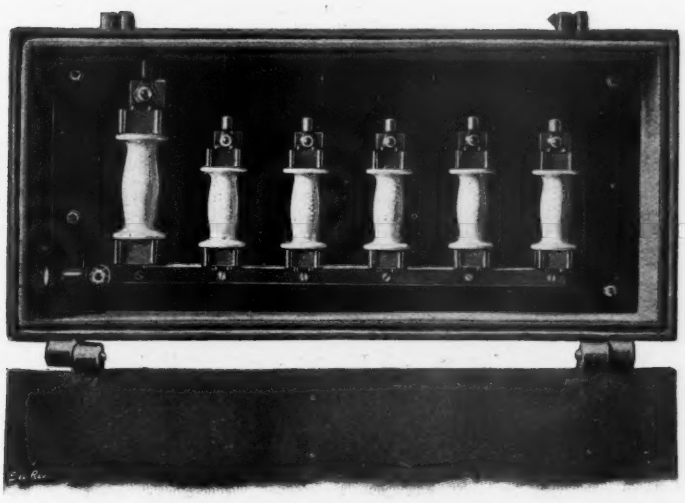


Fig. 119.—Power Fuseboard.

square-ended fuses, as shown in fig. 121. These are made with back or front connections, and are suitable for voltages up to 600. The handles are lined with asbestos tubing, the metal ends being securely cemented to the porcelain, and the clips are of hard-drawn copper and have a large contact surface, thereby reducing any heating tendency.

Fig. 119 shows one of their standard S.P. power fuseboards, one way of 100 amperes capacity and five ways of 50 amperes capacity. We understand that the firm has devoted great attention to the design of these boards, in order to make them suitable for use under the roughest conditions.

Fig. 118 shows their "foolproof" battery regulator switch controlled by two hand-wheels, and a special interlocking arrangement is fitted which makes it impossible to reverse the regulating cells whilst running the plant when lights are in use.

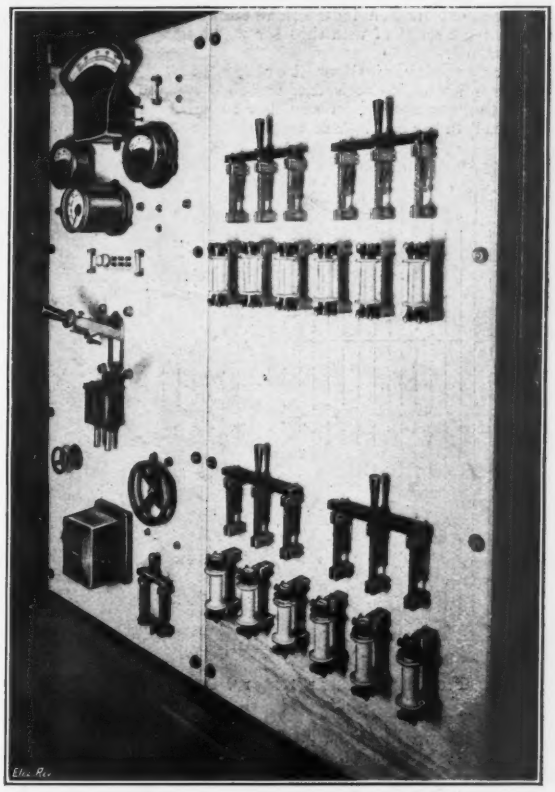


Fig. 120.—Three-phase Switchboard.

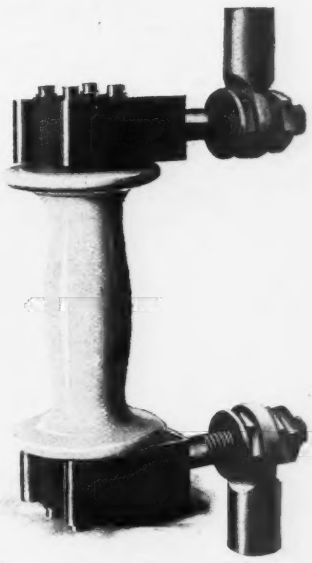


Fig. 121.—Square-ended Fuse.

The board shown in fig. 120 is one recently manufactured by the firm for a three-phase installation of 500 volts, having mounted upon it a triple-pole oil switch, and four of their standard triple-pole quick-break knife switches.

Messrs. Drake & Gorham have laid themselves out to supply switchgear of every description to the trade, and as everything is made at Felix Street, they guarantee all parts to be interchangeable, which is a great convenience when spares are required.

In their pamphlet No. 119, particulars are given regarding prices of their switchboards, switchgear and accessories, also a table of power fuseboard prices, and particulars and prices of the "Nevile" patent automatic accumulator switch.

Major's Insulating Varnishes.

The importance of using only the best of insulating varnishes is well known to electrical engineers. In this connection it is interesting to note that MESSRS. MAJOR & Co., LTD, Hull, have, after careful chemical and electrical researches under the direction of a trained chemical engineer and an electrical engineer, succeeded in producing a series of varnishes for which many valuable properties are claimed.

During the investigations, it was found that linseed oil varnishes, after application to coils, &c., absorbed large quantities of water from the atmosphere, in addition to producing the well-known "green" in the coils. The results of one test on moisture absorption are shown in the curve, fig. 122. A large moisture absorption necessarily means a low ohmic insulation resistance, but more important than this, it produces a low dielectric strength; the dielectric strength varying according to the dryness of the insulation. This is excellently shown in the diagram, fig. 123. In order to obtain a varnish free from these defects, experiments were made with a view to producing preparations without the use of linseed oil in any form, and the result of these experiments was the production of Major's insulating varnishes. The low moisture absorption and constant dielectric strength of these varnishes are shown in figs. 122 and 123.

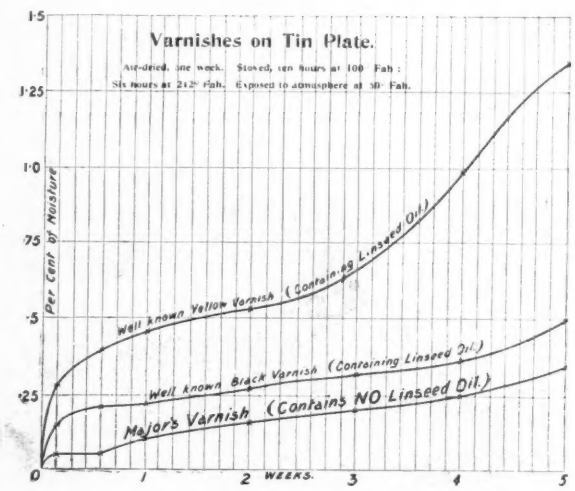


FIG. 122.—ABSORPTION OF MOISTURE BY VARNISH.

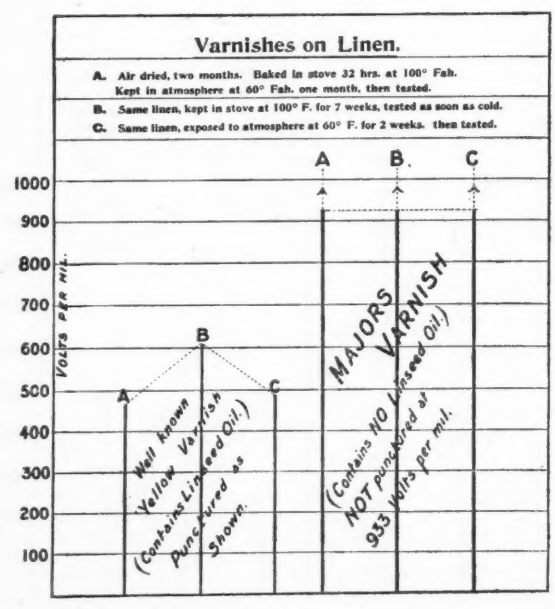

Varnishes on Linen.
A. Air dried, two months. Baked in stove 32 hrs. at 100° Fah. Kept in atmosphere at 60° Fah. one month, then tested.
B. Same linen, kept in stove at 100° F. for 7 weeks, tested as soon as cold.
C. Same linen, exposed to atmosphere at 60° F. for 2 weeks. then tested.
A
B
C
VOLTS PER MIL.
1000
900
800
700
600
500
400
300
200
100
Well known Yellow Varnish (Contains Linseed Oil.) Puncture as shown.
MAJORS VARNISH (Contains NO Linseed Oil) NOT punctured at 933 Volts per mil.

FIG. 123.—EFFECT OF LINSEED OIL ON DIELECTRIC STRENGTH.

With the object of saving time (at the expense of good materials) many quick-drying varnishes have been placed on the market. These varnishes, almost without exception, consist of resin, shellac, or gums dissolved in methylated spirits, or asphaltum, with or without a small percentage of linseed oil, dissolved in light naphtha. As soon as the solvent has thoroughly evaporated from these preparations, they rapidly become brittle. This brittleness is increased by the high temperatures which the insulation is subjected to during the working of the machines, and as a result of vibration, expansion and contraction, &c., a very short time suffices to reduce the varnish layer to a powder, when it is, of course, quite useless as an insulator. In Messrs. Major's varnishes a material which is a thorough insulator has been added, and reduces the above defects to a minimum. The result of exposing various makes of varnish to high temperatures is shown in fig. 124.

In order to obtain the best results with Major's insulating varnishes, it is necessary to follow closely the directions for use supplied with them. It has been found impossible to produce a varnish possessing high qualities, without somewhat modifying the method of application. In order to produce a certain important physical (not chemical) change in the varnish, it is necessary to bestow care upon the stoving operation; care must be taken to remove all the solvent by efficient stoving, and also to see that a perfect film of varnish is obtained on the cotton insulation. Major's varnish dries dust-proof in two hours at 60°-70° F.; after baking nine hours, it is impervious to sulphuric acid and fumes, salt water or mineral lubricating oils.

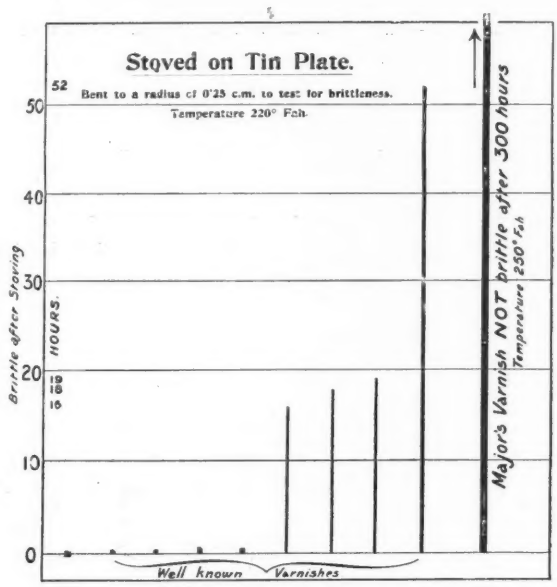


FIG. 124.—EFFECT OF HIGH TEMPERATURE ON VARNISH.

We understand that Messrs. Major produce various grades of insulating varnish to suit the varying conditions in the winding shops. Some of the grades possess special penetrating properties and are eminently suitable for impregnating field-magnet coils; in others it has been the object to produce elastic surface films rapidly. Some are particularly suitable for high-pressure work and where high temperatures are encountered, and others for conditions where stoving has to be dispensed with.

It is also interesting to note that Messrs. Major & Co. have laid themselves out to assist the electrical engineer by making any modification in a varnish that he may think necessary, or to make insulating materials to specification if required; and it is to be hoped that electrical engineers will take advantage of this offer, so that improvements in the insulation of electrical machinery may be furthered.

Suction-Gas Plant for Electric Lighting.

MESSRS. E. S. HINDLEY & SONS, of 11, Queen Victoria Street, E.C., have brought out a new high-speed multi-cylinder gas engine coupled directly to a dynamo, and working in conjunction with a suction-gas plant of improved design. The advantages claimed for this plant are as follows:—The gas plant may be run continuously for 100 to 160 hours without cleaning the fire, while delivering gas of good and uniform quality; the high speed of the engine reduces the cost of both engine and dynamo, whilst giving great steadiness of light and avoiding the loss incurred by belt driving; the engine and dynamo are mounted on one substantial cast-iron base; the lubrication is exceptionally good; a centrifugal throttle governor is used, giving steadier running than a hit-and-miss governor; the engine can run for hours on light load, is well balanced and free from vibration, and has a silent exhaust; and the floor-space occupied is small, while the outfit is light and compact for shipment.

Portable Air-Compressor.

Messrs. Reavell & Co., Ltd., Ranelagh Works, Ipswich, have just issued from the press a new pamphlet (No. C 11), describing fully and giving illustrations, both half-tone and line drawing, and tabulated lists of sizes of their single, two and three-stage compressors, also their unjacketed compressors, vacuum pumps, accessories, special machines and pneumatic hoists.

The developments of the Reavell type of compressor for electrical work have been very great, and a large portion of the firm's output is now composed of electrically-driven compressors with motors for both continuous and alternating currents. They are

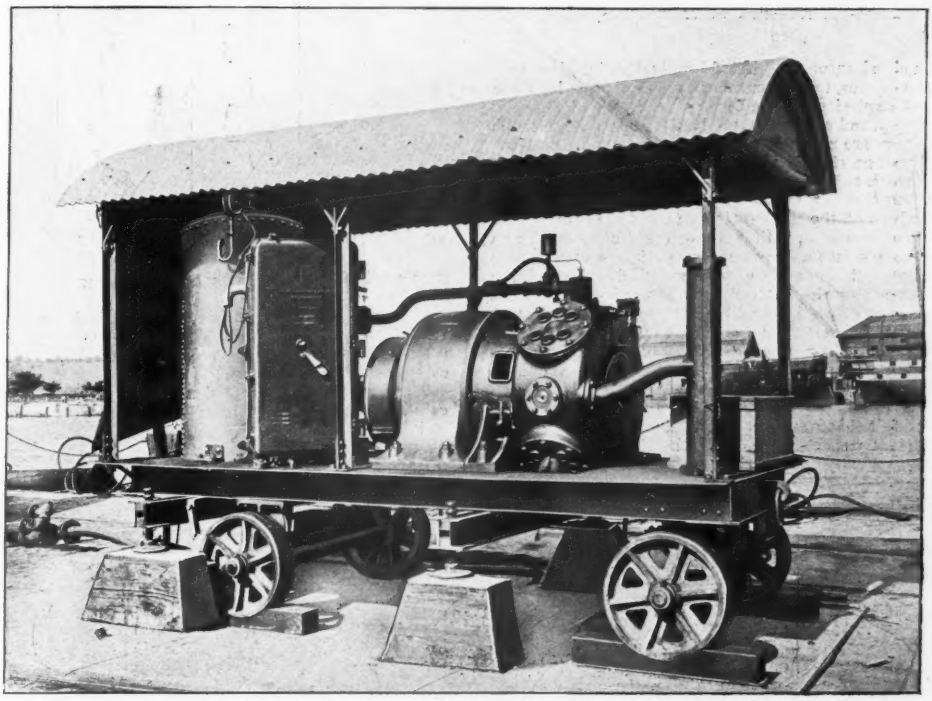


Fig. 125.—Reavell Portable Air-Compressor.

largely used in mining, as well as for pneumatic power in workshops of various kinds. In many other industries also where electricity is being adopted as a motive power these compressors and vacuum pumps are being increasingly used.

Among the pictures in the section devoted to special machines is one of a portable electrically-driven compressor on a wagon. This portable plant is complete with receiver, starting switch, with all necessary connections and panel enclosed in iron case, and in addition it has a suction filter which is seen just behind the front upright at the right-hand side of the illustration, fig. 125. The machine is fitted with an automatic unloading device which is seen just above the compressor; this is described in detail in the list.

New Tramcar Switch.

The Hart Manufacturing Co., of 72, Victoria Street, S.W., have recently placed on the market a new type of tramcar switch, which appears in fig. 126. This is made S.P., 2-way, 2-circuit and 3-circuit, and we understand that it has been largely adopted

Fig. 126.—Tramcar Switch.

by the car builders throughout the United Kingdom. In addition it is used by the L.C.C. on all their tramcars. The claims made for it are that it combines great width of break with rapidity of action, and all working parts are made of case-hardened and tempered steel, contacts of phosphor bronze, and insulation of best India sheet mica.

Ignition Gear for Large Gas Engines.

A reliable ignition gear is of the utmost importance for large gas engines, for, though the engine itself may be thoroughly well designed and constructed, it will not work satisfactorily unless the ignition gear can always be depended upon.

A new system of electric ignition, specially applicable to gas engines employed in electricity generating stations, has recently been introduced by the Felten & Guilleaume-Lahmeyerwerke A.-G., of Frankfort-on-Main. The device consists of a contact apparatus (fig. 127, A and B) which is usually mounted on the camshaft, and one or more strikers (fig. 128, p. 524) which are attached to the cylinders, and operate on the sparking contacts in their interior.

The method of working may be understood from fig. 129, which shows a diagram of connections for the ignition gear of a double-acting two-cylinder tandem gas engine. The contact apparatus

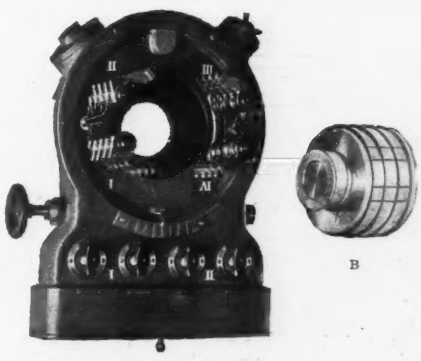


Fig. 127.—Contact Device for Ignition Gear.

comprises one set of brushes for each combustion chamber, each circuit being closed in turn at the right moment. Current then flows through the coils of the striker, attracting its armature, and through the sparking contacts in the combustion chamber; the lever attached to the armature strikes upon the pivoted lever of the sparking contacts, thereby interrupting the circuit and causing a spark to bridge the separated contacts. The operation of the striker is of great importance to the satisfactory working of the apparatus, for it is by its action that the igniting spark is produced with great certainty at a fixed time, and independently of the friction of the moving parts, the force of the blow of the striker upon the lever of the sparking contact being sufficiently powerful to overcome any friction.

These ignition gears are standardised for a working pressure of 65 volts; thus they may be connected, in series with a suitable resistance, to the ordinary lighting supply if this is direct current,

or to the exciting circuit if the main generators supply alternating current. In either case a battery is necessary to supply the requisite current when starting up in the event of all the machines

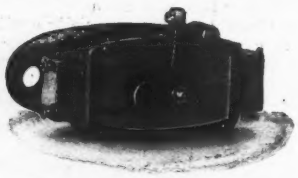


Fig. 128.—Striker for Ignition Gear.

being shut down simultaneously. At 65 volts the ignition gear requires about 6 amperes, the current flowing, however, only at the actual moment of explosion. The battery need, therefore, have only a small capacity, and can easily supply all the ignition circuits with current, as they are never simultaneously in action.

The chief advantage of this ignition gear is that with it it is impossible for a spark to be produced at the sparking contacts at any time other than that for which the brushes on the slip-rings are set. A drawback of the single-pole contact makers employed in earlier devices of this type, is that in the event of an earth or a breakdown in the insulation between two divisions of the split slip-rings of the contact apparatus, current would flow through the faulty circuit, thus giving rise to the danger of pre-ignition. The employment of a contact-making and breaking apparatus operating on both poles removed this danger in the case of the occurrence of an earth, but offered no security against a flow of current, and consequent production of an explosion at the wrong time should the insulation of the slip rings break down.

This danger is completely avoided in the system under discussion, owing to the fact that, as shown in fig. 129, the various ignition circuits are constantly short-circuited on the slip rings except at

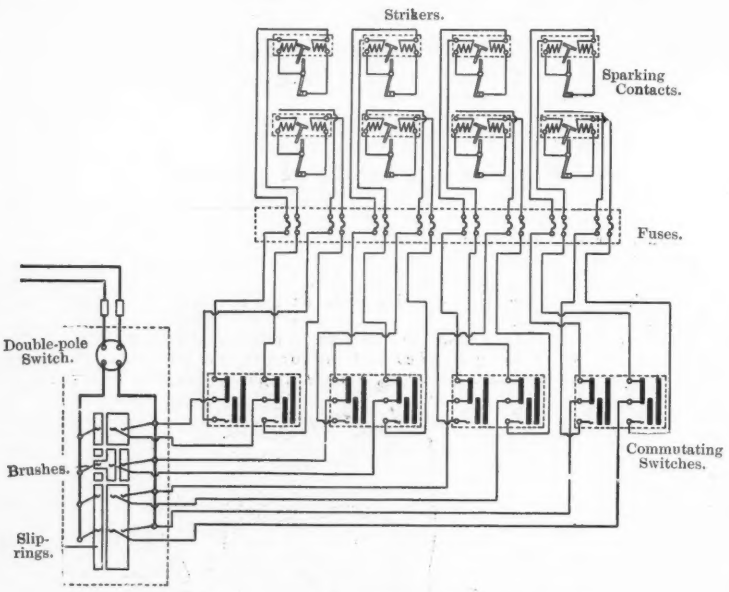


Fig. 129.—Diagram of Connections of Ignition Gear.

the actual moment during which ignition is to take place. Should an earth or breakdown of the insulation arise with this connection, it will result in a complete short-circuit, and the protecting fuse will be blown.

On account of the greater certainty of operation resulting therefrom, it is advisable that two strikers and pairs of sparking contacts be provided in each combustion chamber. Thus, in the case of the diagram here reproduced, eight sets of strikers and sparking contacts are shown instead of four.

As shown in fig. 127, the contact-making apparatus is contained in a strong cast-iron housing, which is firmly screwed to the main gas engine casting. A brush rocker is carried on the front of the housing, and may be rotated through an angle of 50° to permit of the regulation of the time of ignition. The relative positions of the individual sets of brushes may also be regulated within an angle of about 10°, as it is desirable that the time of ignition in the front and back portions of the cylinders of a double-acting gas engine may be differentiated by a fixed angle. In addition to the double-pole main switch attached to the lower portion of the casing, a double-pole commutating switch for each combustion chamber is situated above the brush-rocker spindle, to enable either one of the alternative strikers and ignition contacts, or both together, to be switched in or out; double-pole fuses are also provided in each circuit, and are easily accessible by removing the cover of the casing.

The strikers are also contained in strong casings, from which the levers which perform the actual striking action project. These levers are firmly attached to the armatures, which impart a powerful impulse to them each time the magnet coils are traversed by a current.

The "Indespenso" Connector.

This little device, introduced by Messrs. Ward & Goldstone, of Springfield Lane, Salford, is proving of great value for connecting wires to flexible cords in electroliers and fittings. It saves jointing, and for temporary connections is to be recommended. Its construction is apparent from fig. 130; it will clamp anything

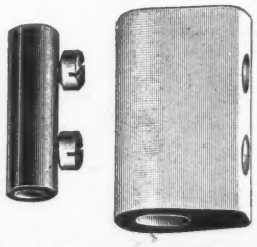


Fig. 130.—"Indespenso" Connector Parts.

from a 7/17 cable to a thin flexible, and is made in 1, 2 and 3 ways as shown in fig. 131.

This firm is also specialising in electric lighting flexible. Its I.E.E. flexible cord is made up with two layers of pure rubber insulation having a radial thickness of 20 mils, and is either silk or cotton-covered as required.

The pure rubber-covered flexible is preferred by many to vulcanised rubber-covered material, particularly for use on counterweights and switch lamp-holder fittings, as it maintains its normal condition far better than the vulcanised rubber flexible. Messrs. Ward & Goldstone carry large stocks of flexible, both pure and vulcanised rubber-covered, made in five qualities.

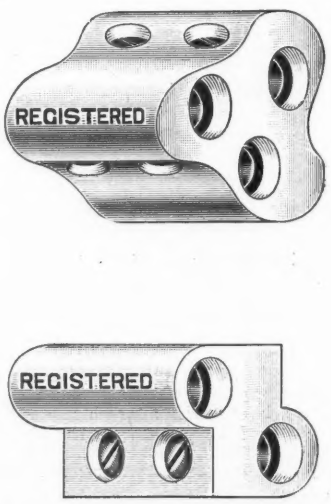


Fig. 131.—Two and Three-Way Connectors.

J. H. Holmes & Co.'s Switches and Instruments.

Messrs. J. H. Holmes & Co., of Portland Road, Newcastle-upon-Tyne, are putting a number of lines before the electrical trade just now. Fig. 133, p. 525, shows their Admiralty pattern double-pole switches in cast-iron watertight boxes. These switches are almost identical with the well-known Holmes-Page patent switches in cast-iron boxes, excepting that the box is made watertight by rubber packing and screw-down nuts and glands. They are also provided with sweating sockets for the cables, and all live parts are mounted on an approved insulating base. The switches are made in 15, 25, 50, 100, 200 and 350 amperes sizes.

Fig. 132 illustrates their projector switch and fuse boxes, which are designed to meet the Admiralty requirements. They are made in two kinds, for permanently connecting up to fixed projectors, and for use with portable connections. They consist of a gun-metal box made watertight by means of rubber packing and screw-down nuts. The switches are of the Holmes-Page chopper type substantially connected together by a gun-metal coupling bar, insulated throughout with mica. The fuses are of copper wire enclosed in asbestos tubes, and are secured under hexagonal brass nuts and washers. The permanently connected-up boxes have sweating eye sockets at both ends for the cables, the boxes used with portable projectors being

supplied with sweating eye sockets for the main cables and thumb nuts with straight sweating sockets for the portable cables. The holes for the latter are provided with insulating bushes and four screwed watertight caps, two for attaching to the projector cables, the other two being fitted to the box when not in use. The whole of the live parts are carried on a substantial insulating base of approved material.

We also show (fig. 134) the "Castle" portable testing set (moving-coil type). This instrument is complete with resistances for use as a voltmeter, and has a range from 0 to 300 and 0 to 600 volts. It is also provided with shunts for use as an ammeter, and measures currents from 0 to 10 and 0 to 100 amperes. It can be supplied for other voltages and currents.

The same firm also supply the "Castle" galvanometer and battery combined, which is mounted in a polished teak case with bright brass or bronzed front and glass-protected silvered dial. The switch on the top of the case enables the instrument to be used with or without the battery in circuit. The instrument is balanced in the stirrup so as to hang with the dial either vertical or horizontal. As the needle is magnetically controlled, it remains at zero in any position of the instrument, when no current is passing. The overall dimensions are 5 in. × 3¾ in. × 4¼ in.

Another line is the "Castle" sector type moving-coil instrument, which is made both as ammeter and voltmeter. It is dead-beat and specially suitable for reading rapid fluctuations. These instruments can be made with illuminated dials, and scales provided for any range. The cases are of cast-iron, with bodies finished bright black stove enamel, the fronts being dead black with nickel-plated rims and facings. Connections are made by means of terminals leading into the base of the instruments.

The "Castle" ammeters and voltmeters, moving-coil and spring-controlled patterns, may also be mentioned. The movements of the former instruments have jewelled bearings. They are dead-beat, with evenly divided scales, and are very suitable for reading rapid fluctuations. The same type is used for ammeters and voltmeters, the latter having a high-resistance coil in the base, whilst the ammeters above 100 amperes have a separate shunt, through which the measured current is passed. The connections between the instrument and shunt are made by small flexible wires. The overall diameter at the base is 8 in. and length of scale about 6 in.

The spring-controlled instruments are similar in appearance and have open divided scales.

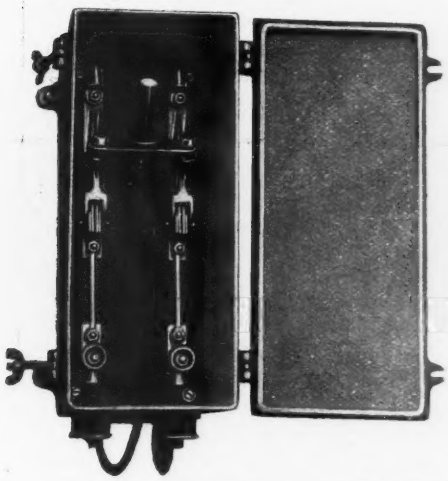


Fig. 132.—Projector Switch and Fuse-Box.

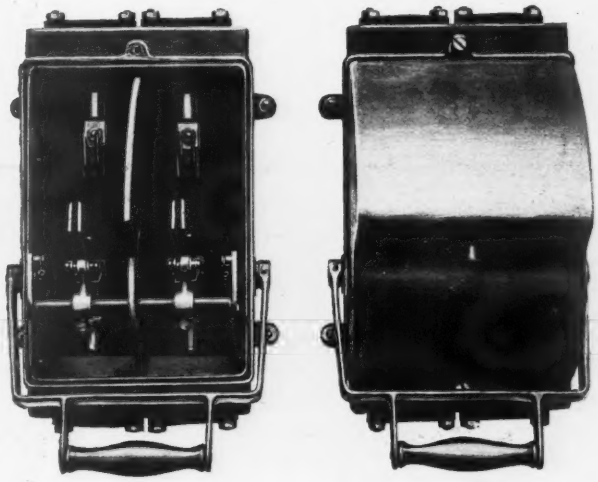


Fig. 133.—Admiralty Pattern d.p. Switch.

Fig. 134.—"Castle" Portable Testing Set.

New Ironclad D.P. Switch.

Messrs. A. Reyrolle & Co., Ltd., of Hebburn, are just putting on the market a new ironclad double-pole switch. They make a double-pole and also a triple-pole type, and the accompanying illustration shows that the switch is specially constructed of a strong serviceable pattern suitable for withstanding rough usage. It is also made watertight, so that it may be used in exposed positions, in mines and factories. The contacts are made so that they can be easily renewed, and the handle is placed in a screened position so that it does not project in front of the switch, and is, therefore, not liable to be injured by any heavy body in passing.

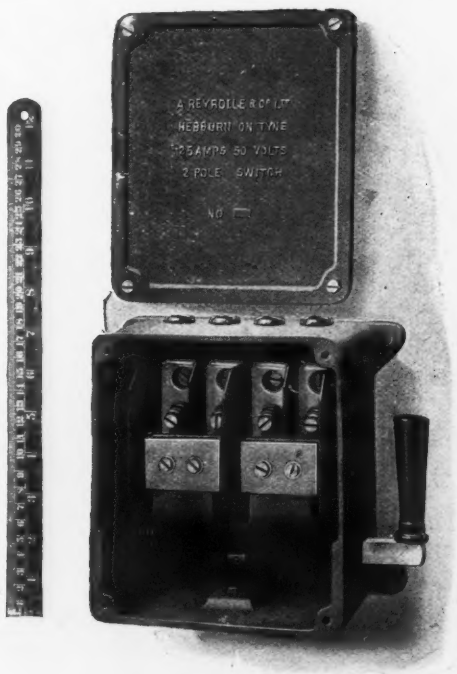


Fig. 135.—Reyrolle d.p. Ironclad Switch.

Switch Cut-out and Magnetic Lamp-holder.

The accompanying illustrations, figs. 136 and 137, show a switch cut-out which has been brought out by The British Insulated and Helsby Cables, Ltd., of Prescot, in four sizes—15 to 100 amperes, at 440 volts.

It consists of a double-pole quick-break switch, two single-pole

replacement fuses, and a sealing chamber, all enclosed in one cast-iron box, forming a neat and compact arrangement.

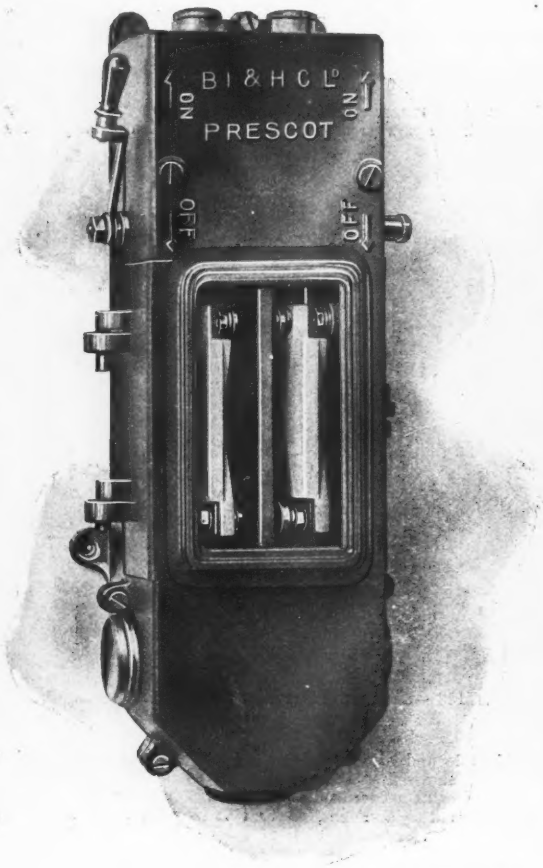
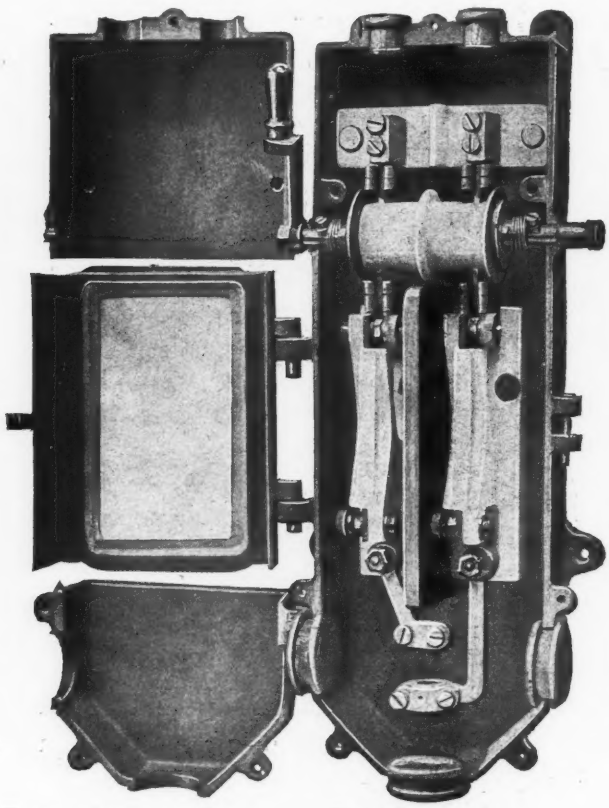


Fig. 136. "Prescot" Switch Cut-out, Closed and Open. Fig. 137.



A novel feature of this box is the construction of the switch, the body of which consists of a porcelain drum, through which the switch blades pass, and all parts of the switch being balanced, the jarring effect produced by the operation of the switch is reduced to a minimum. The spindle upon which the switch rotates is extended through each side of the cast-iron box, so that the handle may be fixed at either side, and all parts of the fitting can be readily removed and replaced. The sealing chamber is arranged so that cables may enter at either side, or at the bottom, and fittings suitable for single, twin, or concentric cables are provided as required.

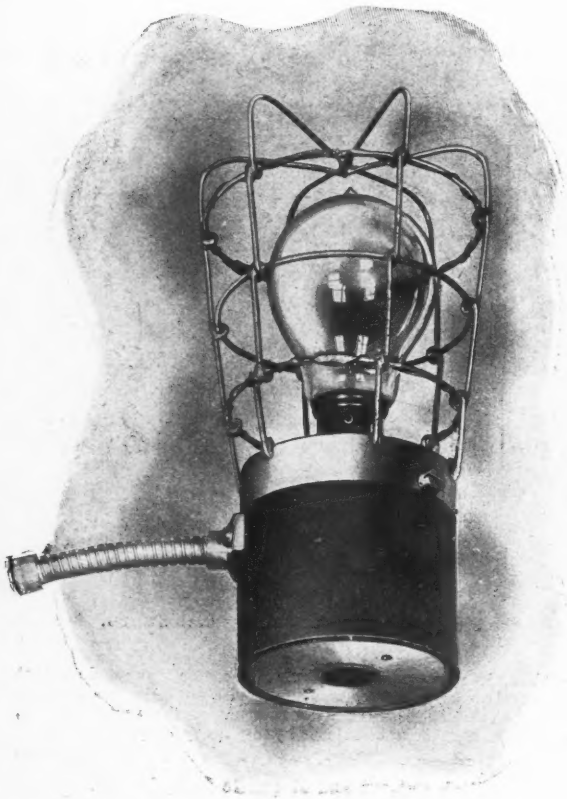


Fig. 138.—B.I. & H. Magnetic Lamp-holder.

Fig. 138 shows a magnetic lamp-holder made by the same company; when the current is switched on, this lamp can be attached to any iron surface, in the most useful position.

High insulation is provided between the brass lamp-holder and the cage, and the screws fixing the cage are provided with holes for sealing, to prevent the removal of the lamp. A short length of flexible metallic tubing is attached to protect the wire.

A neat safety lamp also has been specially designed for use in collieries, mills, gas works, and other dangerous and inconvenient places, with high insulation and first-rate mechanical construction throughout.

Donovan's Switches and Bell Pushes.

Messrs. Donovan & Co., of 12, Barwick Street, Birmingham, are at present supplying the free-blade switch which we illustrate in fig. 139, and for which they claim some entirely new features. The contacts are of their registered design, enabling the blades to make direct contact with the blocks in which the cables terminate, thus saving loss due to joints. The blades are arranged in a novel way so that no heel piece is required to carry them. Two claws are

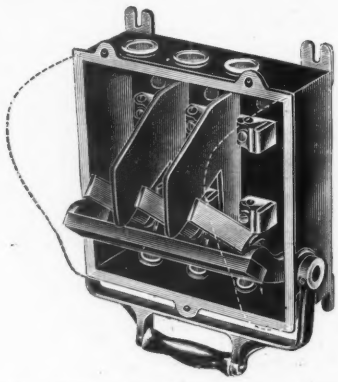


Fig. 139.—Free-blade Switch, Cover Removed.

pivoted in each side of the case, and a coupling piece joins the two claws together. This coupling bar, which is of stout fibre, carries the switch blades. The whole arrangement is stated to result in a very strong switch with a quick action. A double break is obtained, and when throwing the switch off no shock is given to the base of the switch. A solid cast-iron cover, not shown in our view, closes the switch box.

In fig. 140 is shown the firm's improved brass bell push which is not, as is usual, made of soft brass castings, but consists of two parts stamped and raised in powerful presses, thus ensuring uniformity in size and hardness, and with the threads carefully

Fig. 140.—Bell Push, Showing Interior, and Complete.

made in special dies. The interior is screwed in from the front to ensure accessibility, and the arrangement is claimed to be an improvement on the ordinary bell pushes on the market.

Messrs. Donovan have just issued from the press an 80-page illustrated catalogue of a variety of electrical supplies—bells, bell pushes, telephones, switches, lighting fittings, ship fittings, motors, switchboards, motor starters and many other lines. Prices are given in all cases.

Cable Drum.

The drum illustrated in fig. 141 has been designed by Messrs. Johnson & Phillips, of Charlton, Kent, for use in situations where the end of the cable is constantly being moved, and it is arranged so that one man can easily handle it. A feeder cable may be electrically connected to the cable on the drum by means of

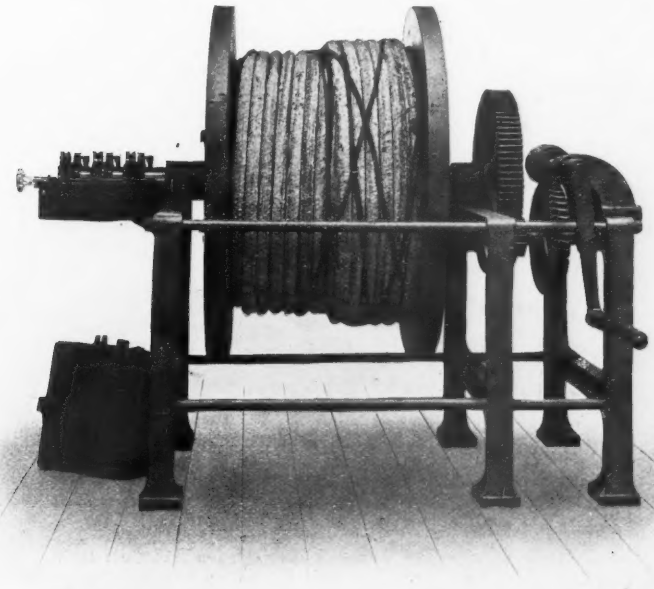


Fig. 141.—Johnson & Phillips's Cable Drum.

brush gear, and the drum is specially serviceable for use with electrically driven sinking pumps, which may then be moved without delay.

Another use is for wharf crane connections, where the drum affords a safe method of storing the connecting cable.

Sound-Proof Telephone Cabinet.

The Westphalian Steroxyle Co., of 7, King Street, E.C., have introduced a sound-proof telephone cabinet of exceptional lightness. The woodwork of the cabinet is specially prepared, the sides, back, &c., being composed of single plates of wood, formed in suitable hydraulic presses, and containing an inner layer of patent composition which, it is claimed, renders these cabinets sound proof.

As only wood is used in the interior, the construction is the most sanitary that could be desired. The cabinets may be obtained in any kind of finish, and in various shapes; they can also be fitted with automatic ventilators if required.

Fuse and Switch Clips.

From 3 to 300 amperes covers a range in fuse and switch clips sufficient to meet all requirements of engineers in stampings of this class. The manufacturers are Messrs. A. E. Harris & Co., who advise us that they find an increasing demand for their productions, also for special clips made to buyers' specification. The large stock of dies and tools (accumulated during the past 25 years) often enables them to save their friends considerable expense in the making up of new patterns. Every kind of small, pressed and stamped work in copper, brass, bronze, &c., is turned out at their works, 95, Camden Street, Birmingham.

Electric Winding Gear.

In fig. 142 we illustrate an electric winding gear, which was recently supplied to one of the Cornish mines by Messrs. Clarke, Chapman & Co., of Gateshead. In view of the rapid progress electricity is making in the working of mines and the discussion which is constantly taking place regarding its suitability for winding, this gear possesses some interest. It is only a small gear, being designed to lift 1½ tons at a speed of 250 ft. per minute from a depth of 720 ft., but we are informed that it has now been working for some time very successfully. The motor is three-phase.

The gear is designed to lift an out-of-balance load of 1½ tons at a speed of 250 ft. per minute. It consists of two drums, each 2 ft. 6 in. in diameter on the tread by 12 in. wide between the flanges, the latter being made deep enough to take the required amount of rope.

These drums are loose on the shaft, driven by means of steel claw clutches, and provided with powerful post brakes, which can be worked by foot levers or screwed down hard by means of the hand-wheels shown in the photograph. This enables either drum to be uncoupled from the shaft and left with a load suspended if desired, while the other drum is worked.

The drum-shaft is driven through two pair of spur reduction gears, the main pair having machine moulded double-helical teeth, the second pair machine-cut teeth, with a raw-hide pinion on the motor shaft. The motor is wound for three-phase alternating current of 400 volts pressure, and is capable of developing 35 B.H.P. when running at a speed of about 700 R.P.M. The controller is of the ordinary crane drum type, and the depth

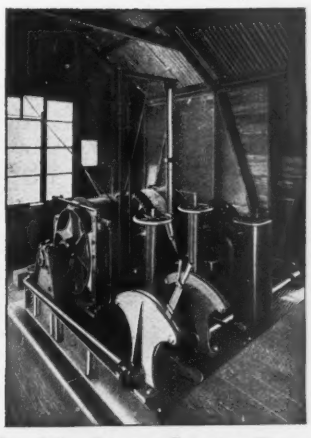


Fig. 142.—Clarke, Chapman Electric Winding Gear.

indicators, as shown in our view, are of the ordinary screw type, driving one from the hub of each drum by means of chain and bevel gear.

Fluxite.

Of recent years, many attempts have been made to simplify the process of soldering, and in this connection the Auto-Controller and Switch Co., of Bermondsey, S.E., have placed on the market their Fluxite soldering paste, a composition which it is claimed can be used with all metals except aluminium, and which does not even necessitate the cleaning of the parts to be joined.

It is claimed to be non-corrosive, and to keep without deterioration; obviously its use is a simple matter compared with the old method.

Some New Motor Control Gear.

A neat patent automatic switch has been designed by Messrs. Vlasto, Clark & Watson, of Stockton Heath, Warrington, for controlling motors which operate accumulator pumps.

The gear, which is shown in fig. 143, consists of one of the firm's

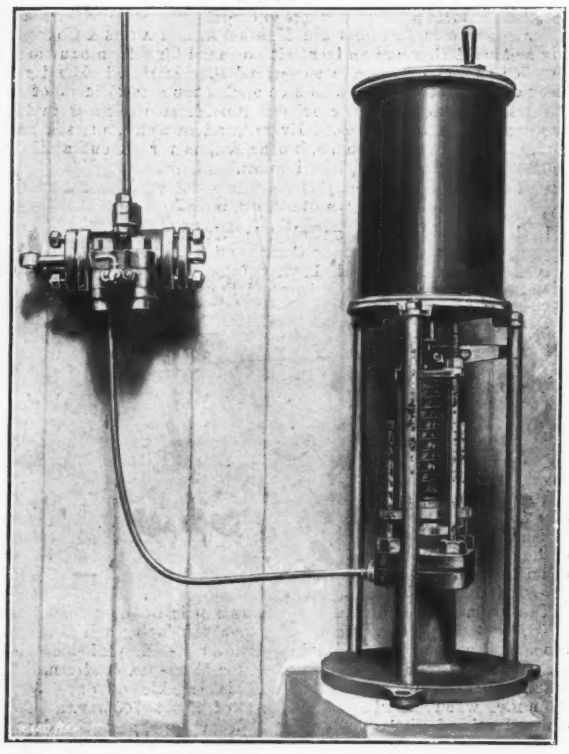


Fig. 143.—Automatic Switch for Accumulator Pumps.

ordinary controller type switches, with the spindle continued downwards and ending in a small ram working in a miniature hydraulic cylinder. The extended spindle is machined with a long-pitch

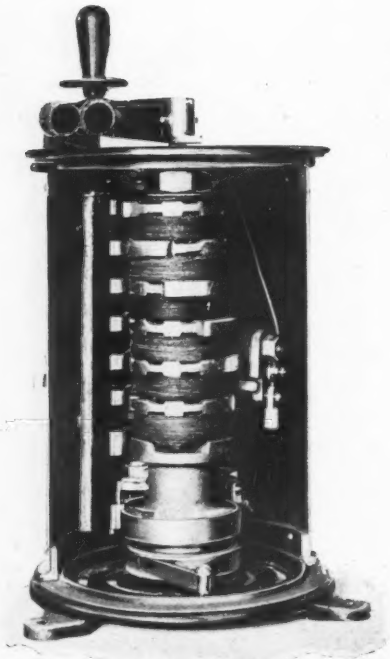


Fig. 144.—Controller Type Starting Switch.

multiple thread working through a nut, and upward or downward motion of the ram causes the starting switch spindle to rotate, moving the switch into the "off" or "on" position.

The accumulator in its lowest position actuates a valve, releasing the water from the hydraulic control cylinder, the ram of which is forced down by a spring; in its highest position, water is admitted to the cylinder and the ram moves up.

The valve referred to, is designed so that the ram goes down *slowly* and up *quickly*, and thus the starting switch moves slowly when starting and quickly when stopping the motor. A clutch is provided for disconnecting the starting switch from the auto-gear when starting up in the first instance.

The controller-type starting switches, one of which is shown in fig. 144, have the resistances mounted on the central cylinder of the switch and bound between the contacts on the same, thus dispensing with wire connections from the contacts to the resistances, and a magnetic blow-out is fitted to all contacts.

Air ducts are provided through the centre of the cylinder, and the case is perforated for ventilation purposes. These switches are built in all sizes up to 100 h.p., and are to standard dimensions.

Reason's New Wall Plug Meter and Time Switch.

There is a pretty general agreement among all engaged in electrical work, that the use of electric power is not on the increase to the extent which its merits would lead one to expect.

While many manufacturing firms have succeeded in bringing to perfection electric heating and cooking appliances, little is being done by the central stations themselves to encourage the use of such apparatus by their lighting consumers, although the load thus gained, if it became considerable, would be of great value in reducing their costs. The chief obstacle is the fact that these appliances are regarded with a considerable amount of suspicion by the average lighting consumer, and he is not prepared to go to the expense of installing separate wiring and a meter in order to be able to make use of them; on the other hand, the cost

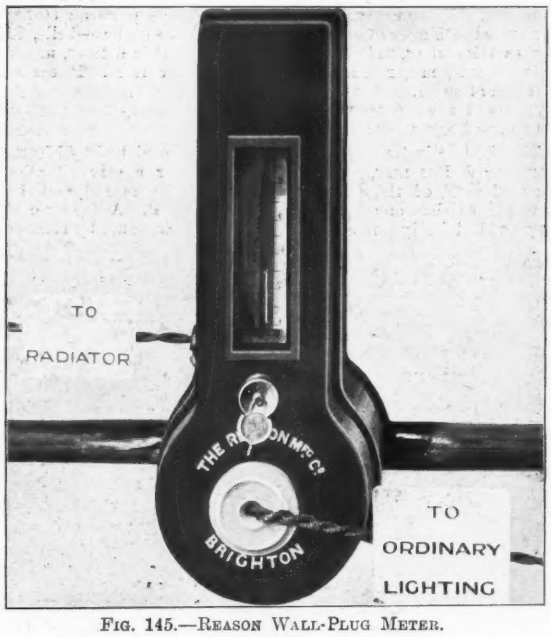


Fig. 145.—Reason Wall-Plug Meter.

of using them at the lighting rate would usually be prohibitive. Much good might be done if the consumer could be persuaded to test these appliances in his daily life with energy supplied at power rates, and at the same time allowing him as a preliminary, a free trial. This can only be done by means of a sub-meter system, and the Reason Manufacturing Co., Ltd., have designed a meter, illustrated in fig. 145, which is specially intended for this purpose. In the usual form this meter is designed to be fitted over a wall plug, which is to be found in most lighting consumer's houses; and the wall plug is not thereby rendered useless for its ordinary work, for a tapping is taken from it, which is connected to a radiator, or other appliance, and metered by means of the small meter. This meter can also be supplied in an ordinary case for instalment in any suitable position. Many supply authorities are debarred from free or hire-purchase wiring, and in any case, capital so employed is irrecoverable, and lies idle if the next tenant makes no use of the service. This meter renders a sub-meter system as cheap in first cost as a separate service, even if several points in different rooms are metered; while any authority may supply the meters, and they can easily be removed and employed elsewhere.

In fig. 146 is shown the new time-switch now being placed on the market by the Reason Co. In the lower capacities this consists of an electrically-wound clock, which releases (by a simple form of escapement), a second spring, also electrically wound, by which the switch is actuated. The novel features claimed for the instrument are, first, the greatly improved system by which the connection is made and broken by the shunt coil, by which the clock is periodically wound. This connection has been a source of trouble in other electrically wound clocks, as the power to operate it has always been very small, and it has consisted generally of two platinum points touched together. In the Reason Co.'s time

switch this connection consists of two arc lamp carbons, the upper one of which is fairly heavily weighted, and the power used to separate the contact after the wind has been effected is derived from the winding solenoid itself. The function of the clock is simply to release the upper carbon and cause it to fall on the lower one. It is claimed that in this manner all the troubles from coils being burned up owing to contacts fusing together, and similar defects, are overcome. Another novel feature is the extremely substantial switch which is employed. Many time switch designs have got over the difficulty of want of power to operate the switch by employing switches, either very much too small for their work, or else of the mercury cup type, both of which are known to practical engineers to be extremely objectionable. By the employment of a separate switching spring, practically no work is thrown on the clock in operating the switch, and at the same time very ample power is available, so that a really adequate switch can be employed. All the parts subjected to wear are accurately and carefully made of the best steel, which is hardened and tempered so that the wear is negligible. The clock movement is doubly enclosed from dust, &c., and is inaccessible to the meter inspector, who is only concerned with setting the dial and seeing that the switch is in the right position. For large capacity switches a device is used by which the standard type of Cantie switch is operated electrically. This is done by a simple step-by-step action, the power being derived from an electro-magnet in parallel with the electric wind of the time switch. The time

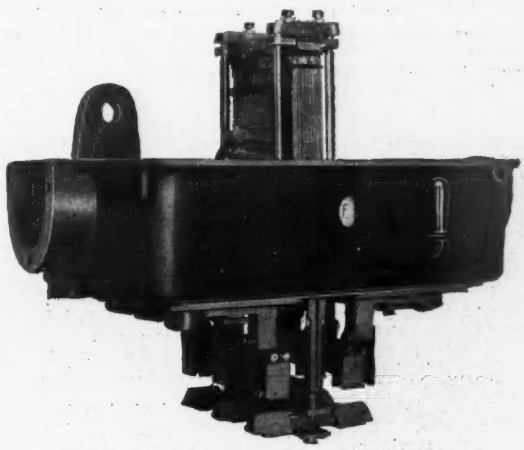
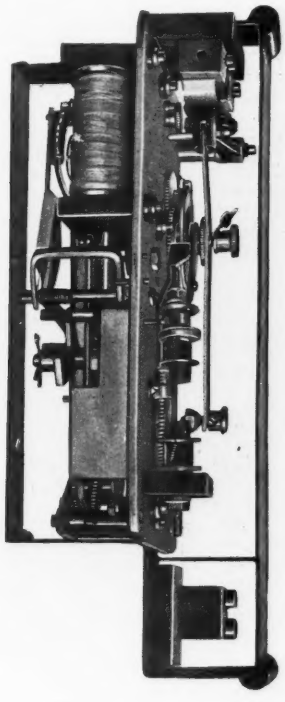


Fig. 147.—Remote-Control Oil-Break Switch.



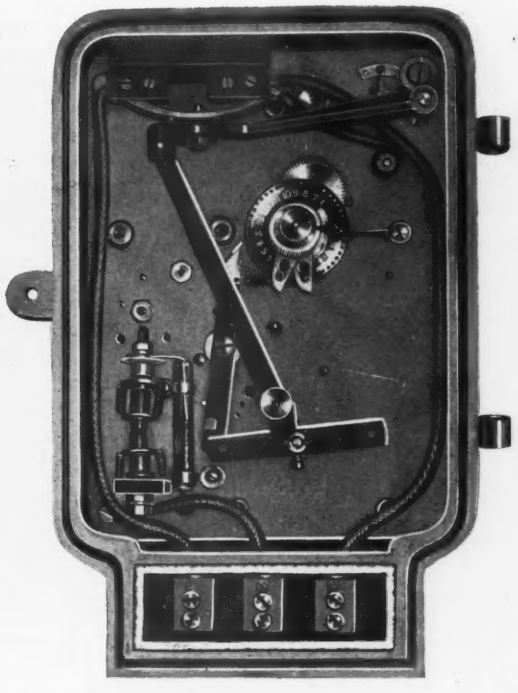


Fig. 146.—Reason Co.'s Time Switch.

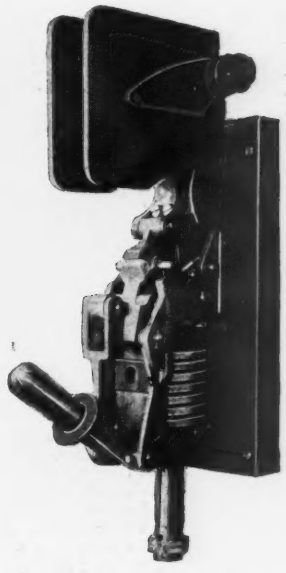


Fig. 148.—Eckstein, Heap Circuit-Breaker with Magnetic Blow-out.

switch throws in the coil of the magnet when the switch is required to open or close, and when the switch is actually thrown in or out, the magnet is again cut off. The whole apparatus is entirely automatic.

Some Eckstein, Heap Switch Specialities.

Owing to the extension which has recently taken place in the driving of textile factories, colliery and haulage gear, machine tools, &c., by means of three-phase motors, it has become imperative that suitable switchgear shall be installed.

Hitherto, ordinary hand-operated switches, combined with fuses, either of the open or ironclad type, have been used. However, no engineer at the present time would connect up a direct-current motor which was not protected by a starting switch having an automatic no-voltage release, although there are a great many three-phase motors controlled by switches not possessing this feature.

Messrs. Eckstein, Heap & Co., of 5, Chapel Walks, Manchester, during the last 18 months have made a speciality of the manufacture of oil break switches. Fig. 147 illustrates a type of switch suitable for 200 amperes per phase. These switches are of the remote control type, operated by means of push-button switches, and their action is as follows:—

When the push button is pressed, the electro-magnet shown in the illustration is energised, thus drawing up its plunger. This plunger acts on a bell-crank lever connected to a pair of toggle links, which, in turn, operate the movable carriage carrying the main contacts. When the plunger is drawn up, it pulls the bell-crank lever up, and throws these links over their dead centre, thus holding the main contacts rigidly in position and closing the main circuit.

The electro-magnet plunger is held against the yoke until the voltage of the supply circuit fails, when the plunger falls and hits the bell crank, automatically dropping the movable carriage and opening the main circuit.

The overload tripping devices consist of three-pole relays, of the ordinary plunger type. When the plunger is drawn up, it operates the small switch which breaks the circuit of the electro-magnet referred to above.

As will be seen from the illustration, the switches are of the oil-break type, and, furthermore, the construction is such that the switch closes with a positive "quick make" action; this is essential, as, owing to the large starting currents which short-circuited rotor motors take, if a careless operator hesitates in closing the ordinary type of switch, destructive arcing takes place at the contacts.

As these switches are of the remote-control type, it is easy to

so interlock them with auto-transformer and rotor resistance starters, so that it is impossible to close the main switch unless the starting switches are in the correct starting position.

These switches are made in standard sizes of 15, 50, 200, and 500 amperes per phase.

Fig. 148, p. 529, illustrates a circuit-breaker by the same firm, in which the contact brush is of the laminated copper brush type, with renewable copper sparking fingers, and final carbon breaking pieces.

The brush is closed by means of a handle operated through two links, which, in the normal closing position, fall over their dead centres. If the circuit is closed when an overload occurs, a plunger rises in the main coil, hitting a striking piece, which, in turn, hits the axle upon which the above mentioned links turn, thus knocking them over their dead centre, breaking the knuckle and allowing the main brush to open.

It will, therefore, be seen that it is impossible to hold these circuit-breakers closed on an overload or short circuit.

In addition to the carbon breaks, a magnetic blow-out is provided, the chief function of which is to locate the arc in the fireproof shields provided.

These circuit-breakers are made in standard sizes from 50 to 3,000 amperes, of the maximum, maximum and no-volt, reverse-current, and maximum and reverse-current types.

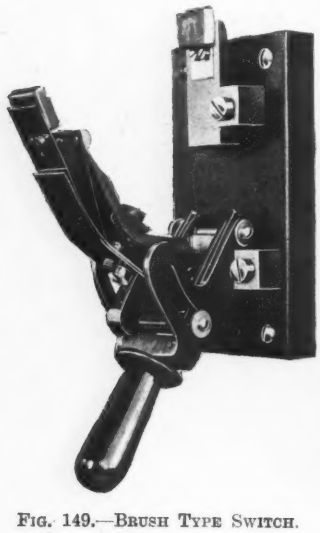


Fig. 149.—Brush Type Switch.

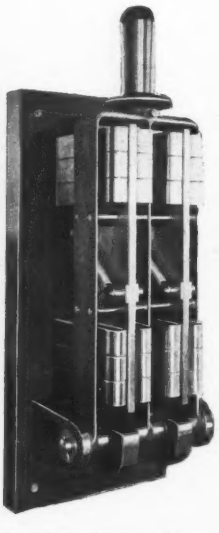


Fig. 150.—Knife Switch for 3,000 amperes.

Messrs. Eckstein, Heap & Co. are also making a series of brush switches constructed on similar lines to the above circuit-breakers, but, of course, without automatic features; also a series of knife switches. Fig. 149 illustrates a 50-ampere brush switch.

The knife switches are made in sizes from 30 to 3,000 amperes; one of their chief features is that the main current carrying blade is fixed. Fig. 150 illustrates the 3,000-ampere single-pole switch, in which it will be seen that the main blade is fixed rigidly in the iron frame, which turns on an axle passing through the pedestal.

The quick-break action is obtained by means of a light renewable sparking piece. This construction has the advantage that it is impossible for the main blade to get out of alignment after it has once been set up in connection with the main contact jaws.

Furthermore, as the heavy blade does not move on an axle there is no wear and tear on it, and the light sparking piece breaks very rapidly.

The pedestal is provided with a plunger attachment, which holds the switch in the "off" position at right angles to the panel upon which it is mounted. The switch is consequently dead in that position.

A Cape Colony Lawsuit.

On August 29th judgment was delivered by Mr. Justice Maasdorp in the Supreme Court in the case of Bell *v.* Estate of Arthur Douglass and J. L. Bradfield, which related to the Queen's Town (Cape Colony) electric lighting. The action was brought by Mr. J. W. Bell, formerly Master of the Supreme Court at Pretoria, against the estate of the late A. Douglass for £610, and against Mr. J. L. Bradfield for £393, being balance of moneys expended by plaintiff on account of a partnership undertaking in which he was interested with defendants, and which was known as the Glen Grey Works and Mill, the object of which was to supply Queen's Town with electric light. A further sum of £333 13s. 4d. was claimed against each of the defendants for remuneration to plaintiff as manager of the works. After the examination of numerous witnesses in the course of the trial, which occupied several days, judgment was given for plaintiff for £610 and costs.

Some Universal Manufactures.

A street lighting bracket for metallic filament lamps made by the Universal Electrical Manufacturing Co., of Station Parade, Queen's Road, Peckham, is shown below. Fig. 151 shows the bracket as made for fixing on the top of the ordinary gas lamp-post, and fig. 152 the same bracket suitable for fitting to a tramway or other pole. We believe that it has frequently been found that altering existing gas lamp-post brackets

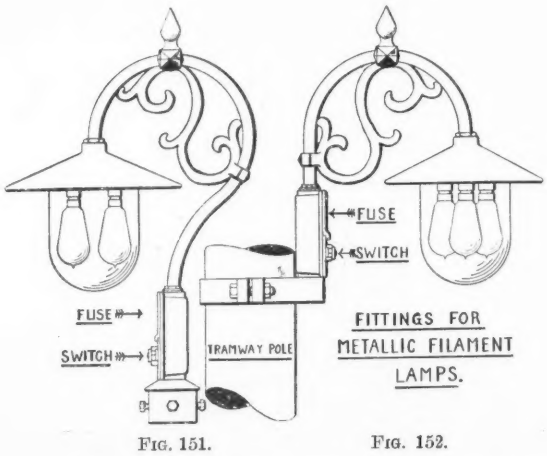


Fig. 151. Fig. 152.

from gas to electricity, by simply putting electric lamps in the existing lanterns, does not give a good result, and the swan neck bracket is now being generally used. The design is cheap but substantial, and the alteration can be made at quite a low cost. The brackets are made suitable for either one 100-c.p. metal filament lamp or 2, 4 or 5 32-c.p. metal filament lamps, and they can be supplied either with or without glass globes. The brackets are fitted with a S.P. switch worked from the outside and either one or two S.P. fuses, the lid of the box containing this gear being

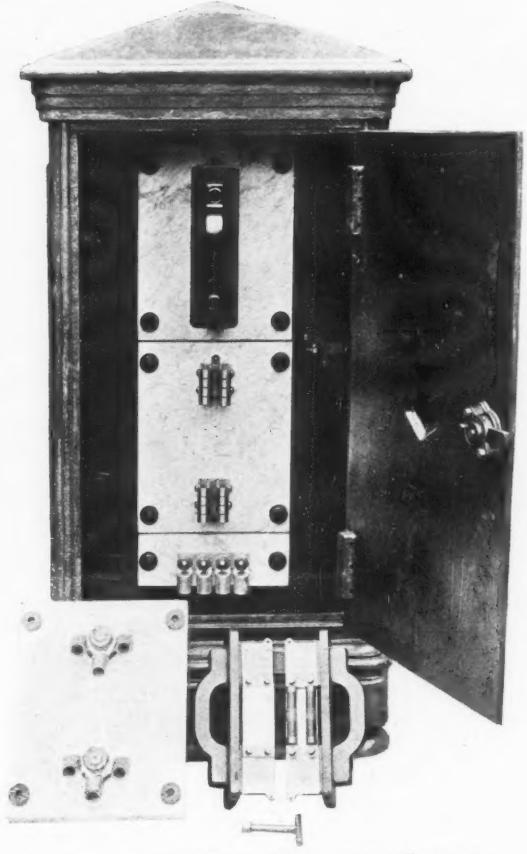


Fig. 153.—Feeder Pillar, 1,000 amperes Capacity.

made in two parts so that the fuses can be got at without interfering with the switch. With the globe, the brackets are entirely watertight, and they have a neat appearance. The brackets being fitted with switch and fuses, can be supplied direct from a distributor or tramway feeder.

In fig. 153 we show a 1,000-ampere feeder pillar, this being one of the 61 disconnecting feeder pillars being supplied to the Ealing

Corporation by the Universal Co. The pillars have been made to the specification and under the supervision of Mr. J. Douglas Knight, the Corporation's engineer, and they are required for insertion in the various feeders in accordance with the new Board of Trade regulations for fuses in feeders. Each pillar contains a switch fuse in each of the outers and a bus-bar for the middle wire cables. The pillars are of neat and substantial design throughout, being ventilated (but rain and splash-proof) both top and bottom, and they have two doors, each having the Corporation's coat of arms, Corporation's name and the year cast on in a sharp bold design. Each pole of the circuit is mounted on a separate polished marble slab, there being a gap between; all slabs are insulated from the angle-iron supports. There are three cable sockets on each of the stems of the fuses, the back of one of the panels being shown on the left-hand side at the bottom of the illustration. All these cable sockets are cast with the hole for the cable at an angle so as to give the cables a lead away from the back

Fig. 154.—Porcelain Clip Fuse.

of the marble, and in addition the middle-wire cable sockets are fixed on the front of the slabs so as to give more room at the back for the other cables. The fuse carriers are shown at the bottom right-hand corner of the illustration, and are of the shunted type, the handles being made of a highly insulating, non-hygroscopic, fireproof material of a very tough nature; porcelain is not used, as it was objected to owing to its being considered much too brittle for pillar work. Owing to the design of the contacts, we understand, even the 1,000-ampere fuses are manipulated with ease, and yet a very good contact is obtained. Every detail has been given most careful consideration, and the pillars have a very neat appearance both inside and outside.

Fig. 154 shows the same firm's new form of porcelain clip fuse, which is meeting with general approval. The fuse wire is taken from the underside of a milled nut down through a small slot at the bottom of the carrier, and up again to another milled nut on the other side. By this means a greater length of break is obtained, and also there is a solid block of porcelain between the two clips, which entirely prevents the arc being maintained from one contact to the other. The fuse is of a neat and substantial design, and is made in three sizes, viz., 18 amperes, 25 amperes and 50 amperes, all at any voltage up to 300, or they can be used for 3 and 10 amperes at 500 volts.

Oil Switches.

Messrs. Johnson & Phillips, of Charlton, Kent, who have for many years been to the fore as electric light and power contractors,

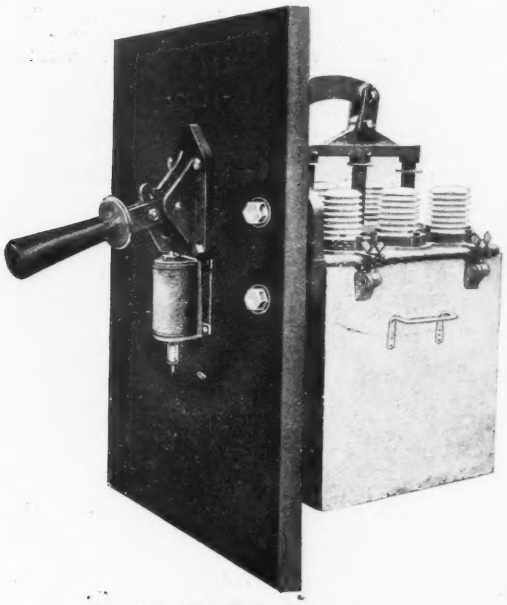


Fig. 155.—J. & P. Oil-Break Switch.

are now making oil switches for all pressures, one of which is shown in the figure. Particular care has been bestowed on their design, especially in regard to the contact areas, contact stems and current-carrying parts. In the e.h.t. oil switches, sufficient creeping surface has been allowed to provide against breakdown with 50 per cent. above normal pressure.

The switches are constructed for either direct or automatic working, and can be fitted with overload releases and loose handles, or time-limit attachments. The oil bath is of ample size, and can easily be emptied.

Lundberg Specialties.

Of the bewildering variety of small switches developed by Messrs. A. P. Lundberg & Sons, 477-87, Liverpool Road, N., we can select but a few for special notice. First is the "Pivot Combination" (patent), of 10-ampere capacity, shown in fig. 156. This switch and plug has been specially designed for radiators and cooking apparatus, and can be arranged with patent contact pins and sockets to prevent any possibility of lighting-circuit plugs being inserted in error (?) and tapping current at power rates. It has a patent variable leverage action allowed by the movable fulcrum movement, which locks the contact arm in its "on" position, thus preventing any annoying rupture of the circuit. The

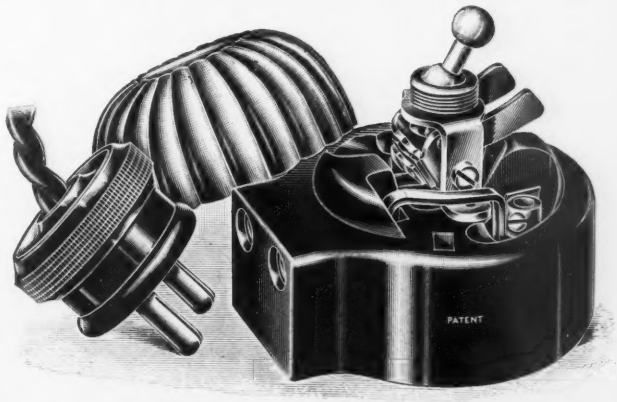


Fig. 156.—Pivot Combination Switch and Plug.

switch has a wide and long break, and is substantially designed with looping-in terminals. The covers may be locked to the bases when desired, to prevent removal by unauthorised persons, or to allow directions to the user to be printed or engraved on them.

Fig. 157 shows a patent heating connector which, like the former, has been specially designed for use on circuits intended for power and heating apparatus. It allows of the use of accessories as small as are fitted for lighting requirements, and is acceptable to the supply authorities owing to its non-interchangeability with lighting apparatus.

The principle is also applied to "Tripin" and "Multiple" plugs for special apparatus, and to the two-pin type when current is

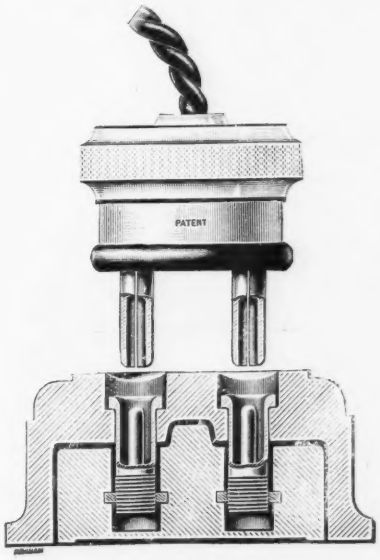


Fig. 157.—Heating Connection.

required to pass in one direction only; for example, in the case of Nernst lamps, plating, ignition-cell charging, &c. One pin and one socket are specially arranged, ensuring insertion of the plug in one way only, and thus preventing any possible reversal of current in the apparatus attached.

By the use of the patent "Tripin Combination" (2-way type) (fig. 158, p. 532) ordinary single-way switches as at present fitted near the door of a room may be replaced without alteration of the wiring, and a flexible with a two-way pear switch attached, reaching to any desired position, and allowing control of the lamps from either the fixed or the extension switch as desired.

Fig. 159 represents a new type of tumbler motor-starting switch. It is made in 5 and 10-ampere capacities, and is intended for induction motors in which a starting coil is employed, this being cut out of circuit by throwing the knob over into the "Full on" position after the motor has been fully started.

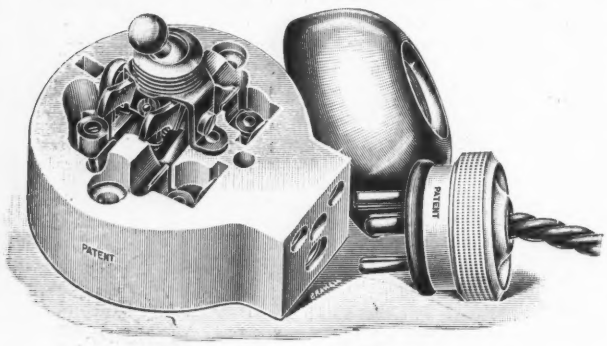


Fig. 158.—Tripin Combination.

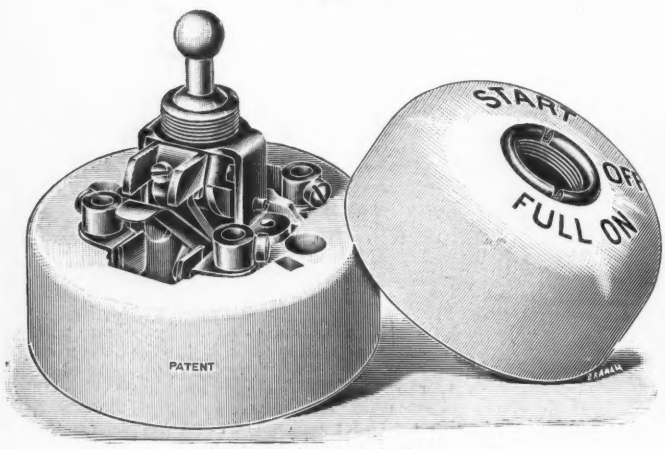


Fig. 159.—Tumbler Motor-starting Switch.

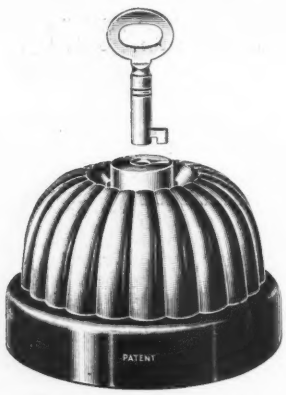


Fig. 160.—Key Switch.

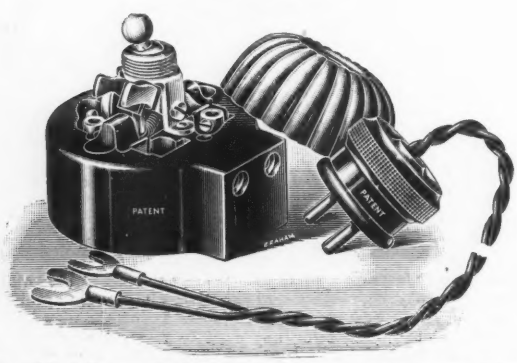


Fig. 161.—Tripin Combination Switch and Charging Plug.

In order to prevent damage to the motor, the knob is arranged so that it cannot remain in the starting position, but flies out automatically when the pressure of the hand is removed.

Fig. 160 shows a novel type of removable-key switch, which is not easily picked; this can be fitted with a locked cover, and is then an ideal arrangement for use in asylums, schools, &c., as it cannot be tampered with.

Lastly, fig. 161 shows the "Tripin Combination" switch and charging plug for the convenient and safe charging of small ignition cells for motor-cars and cycles. The switch simply replaces any ordinary single-way switch on direct-current circuits, without extra wiring, and allows of control of the lamp circuit independently of, or in series with, the battery being charged.

The battery may be left in connection without any possibility of damage resulting.

A New Tramway Pole-base.

Messrs. Hardy & Padmore, Ltd., of Worcester Foundry, Worcester, have recently introduced a patent cast-iron base for tramway poles.

While it is a moot point whether a cast-iron pole-base is necessary or advisable, there are many thousands in use; and it is certain that where they are favoured, Messrs. Hardy & Padmore's

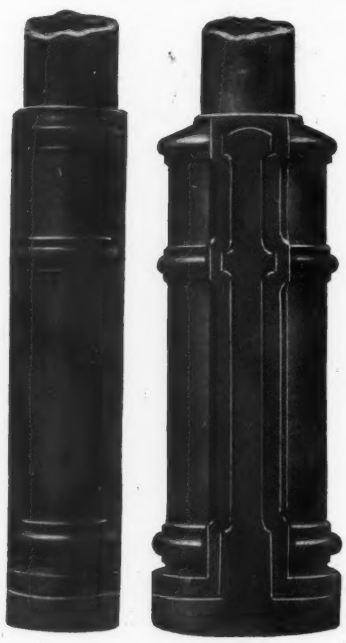


Fig. 162.—Front and Side Views of Pole-base.

flattened oval section, saving as it does some 7 in. of valuable space in pavement width, will meet with an unhesitating preference over the usual circular base. We illustrate in fig. 162 two views of the new base.

Electric Bells.

Messrs. Townshends, Ltd., of Ernest Street, Holloway Head, Birmingham, bell founders, are making every class of bell domes for electrical and general purposes. Below are illustrated several

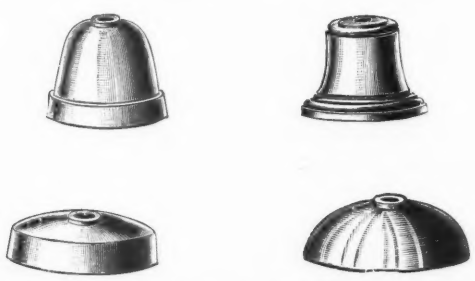


Fig. 163.—Domes for Electric Bells.

of their standard patterns. The firm are contractors to H.M. Post Office, the War Office, railway companies, &c. They make a speciality of tuned bells.

Spagnoletti Watt-hour Meters.

Messrs. J. E. Spagnoletti & Co., of Goldhawk Road, London, W., are supplying an improved form of alternating or direct-current watt-hour meter, shown in fig. 164.

In these instruments the shunt coil is wound on a magnet built up of soft iron stampings, the magnetic circuit being completed through the narrow gap in which the aluminium disk revolves.

The reluctance of the gap is kept small by enlarging the faces of the poles. The series turns are wound in slots in the face of the expanded pole, the iron circuit enclosed being incomplete, and therefore the flux remaining proportional to the current.

The starting friction is reduced to a minimum by accurate workmanship and the lightness of the parts.

Fig. 164.—Spagnoletti Watt-Hour Meter.

The permanent magnet is provided with an adjustment for damping, and is not affected by short circuits through the instrument.

These meters are supplied in sealed air-tight cases, and the cable terminals are placed in a separate box from the meter movement, to avoid interference with the latter when fixing.

The "Kalkos" Tinned-Tube Conduit.

In spite of the number of inventors who have busied themselves with the subject of conduits for interior wiring, finality is not yet in sight, unless the new "Kalkos" system of the Sun Electrical Co., Ltd., of 118-120, Charing Cross Road, W.C., proves to be the last word on this question. Undoubtedly the system has many unique advantages, and for some purposes it is probably unexcelled save by an absolutely solid—and correspondingly expensive—system of wiring. It is questionable whether any system of wiring in existence or conceivable, in which air spaces exist in the conduits, can be made absolutely watertight, which, in this connection, means also airtight, but it will be seen, from the following description, that the Sun Co.'s system goes about as far as it is possible to go in that direction. To begin with, brass tubes are employed for the conduit, tinned inside and out, and socketed together with slip sockets. All the fittings, such as switch and ceiling-rose boxes, elbows, tees, &c., are also tinned, so that it is an extremely easy operation to solder all joints and make the system both watertight and metallically continuous throughout. The tube is at present stocked in two sizes, $\frac{3}{8}$ in. and $\frac{1}{2}$ in. in diameter inside, the former being used mainly for concentric work in which the tube itself is used as the return conductor, while the larger size is suitable for the ordinary two-wire system.

We have seen the different items, and have formed the conclusion that in respect of ease of erection and the probability of soundness of workmanship—in dealing with wiremen one has to discount their skill as far as possible—the system leaves little to be desired. It is claimed that the tinned brass tube is not liable to sweat or to suffer corrosion; a touch of the blow lamp makes a perfect joint in the tubing, at minimum cost; the smooth interior of the tube facilitates the drawing in and out of the wires, even after they have been installed for years; the small size of the tubes enables them to be laid in the thickness of the plaster, without chasing the brickwork; there is no waste, and the tubes are easily bent.

Not least of the noteworthy points about the system is the series of fittings and accessories devised in connection with it, and shown in figs. 165 to 169. A standard box serves equally well for switches, wall sockets and ceiling roses: almost any of the standard tumbler switches, &c., can be used with it, and by an ingenious modification of the design, accommodation is provided to enable the fitting to bed itself evenly while the cover remains stanch and tight. This principle is carried further in the case of flush fittings, so that if the box be put in crookedly, the flush cover will still lie flat upon the wall surface. But the most striking novelty, and one which is applicable also to fittings for ordinary screwed conduit, &c., is that which is illustrated in fig. 165, namely, an adjustable seat inside the box. When buildings are wired or tubed (as they should be) before the walls are plastered, the eventual thickness of the plaster is generally a doubtful quantity, and much inconvenience is caused in consequence of an unexpectedly thin or thick layer being applied, in packing up the switch or socket to the correct level for flush purposes. In the new "Kalkos" box, this difficulty is completely overcome; a ledge to support the switch is provided with a flange threaded to fit the screwed interior of the box, and all that is necessary is to screw it in or out until the proper depth is attained. A variation of $\frac{1}{2}$ in. is provided. The brass cover which holds the switch in place is similarly threaded, and when this is screwed into the box, the whole outfit is locked firmly in position. The flush wall-plate is held on the cover by a screwed ring, with a coned fit which gives the adjustment mentioned earlier in this article. In the case of the ceiling rose, the porcelain is spherically shaped so as to form a tight joint with the cover; and in an improved pattern of switch a watertight joint between the tumbler and the seat is ensured. An improved wall socket is also on the way. We have not space to deal further with this system; those interested must be referred to the makers.

Fig. 166.—Surface Switch-Box Complete.

Fig. 167.—One-Way Outlet Reducer.

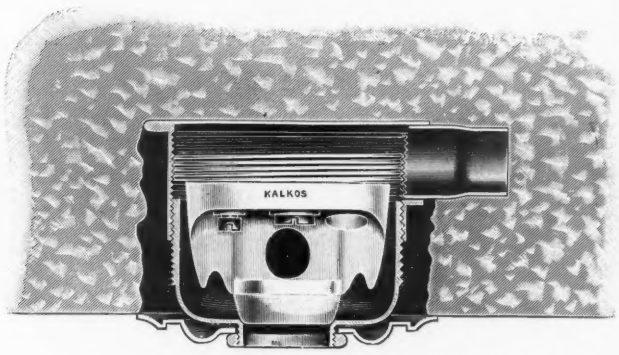


Fig. 165.—Half-Section of Flush Ceiling-Rose Box, showing Method of Erecting.

Fig. 168.—Surface Plug-Box, Complete.

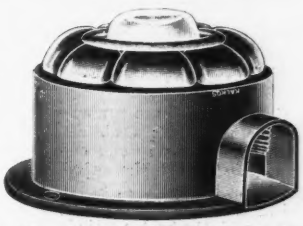


Fig. 169.—Surface Ceiling-Rose Box.

Paul Measuring Instruments.

Amongst other new electrical instruments, Mr. R. W. Paul, of New Southgate, N., has recently brought out the reflecting galvanometer illustrated in fig. 170, p. 534. This instrument is specially made to withstand rough usage in a works or college laboratory, while retaining high sensibility. A special device of novel design, partly visible on the top of the instrument, has been provided to clamp the coil, and has the advantage that it is actuated from outside; besides firmly fixing the coil, it relieves the suspension from strain. The working parts are completely exposed when the cover is removed, and are highly insulated. Interchangeable coils can be supplied, and are easily suspended, the suspension being attached to a pin, which is clamped in place. The deflections of the aperiodic coils are 15 and 90 mm. per micro-ampere at 1 m. radius, and of the ballistic coil 250 mm. per micro-coulomb.

Fig. 171 shows a large circular shunt of the "Universal" type, with 23 contacts, giving 21 shunt-powers, from 1 to 10,000, so that large and convenient deflections can be obtained for any current within the range of the instrument. The parts are well insulated,

Fig. 170.—Paul's Reflecting Galvanometer.

and the figures plainly marked. This pattern can be used as a ratio box for multiplying the readings of a voltmeter for pressures up to 200 volts. The total resistance is one, ten or a hundred thousand ohms, as required. The convenience of this type of shunt, which can be used with any galvanometer, gives constant damping, and is not affected in ratio by changes of temperature, is too well known to need emphasising.

In fig. 172 a "Decade" dial resistance box and bridge, of switch pattern, is illustrated; this is fitted with switches of an improved

Fig. 171.—Large Circular Shunt-box.

patent type, ensuring low-resistance contacts. Each dial contains 10 coils, and is complete in itself; a substantial brush switch makes contact with the bobbin plates at one end, and a flange at the other, no current passing through the switch spindle. The dials are clearly figured on a white ground, and are covered with glass. As shown, the resistance box is conveniently mounted on a desk stand in combination with the bridge-ratio box.

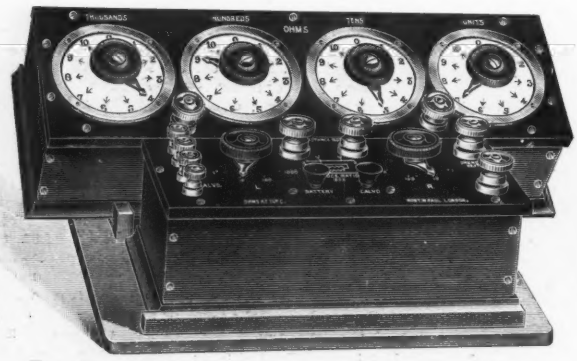


Fig. 172.—"Decade" Resistance Box and Bridge.

These instruments, with many other new designs, are described in three sections of a new catalogue which Mr. Paul has in preparation. In this connection the Duddell-Mather standard wattmeters and anti-capacity gauze resistances call for special mention.

Arc Lamp Lowering Gear.

We illustrate a new design of lowering gear for automatically connecting and suspending arc lamps, which is made by the North-

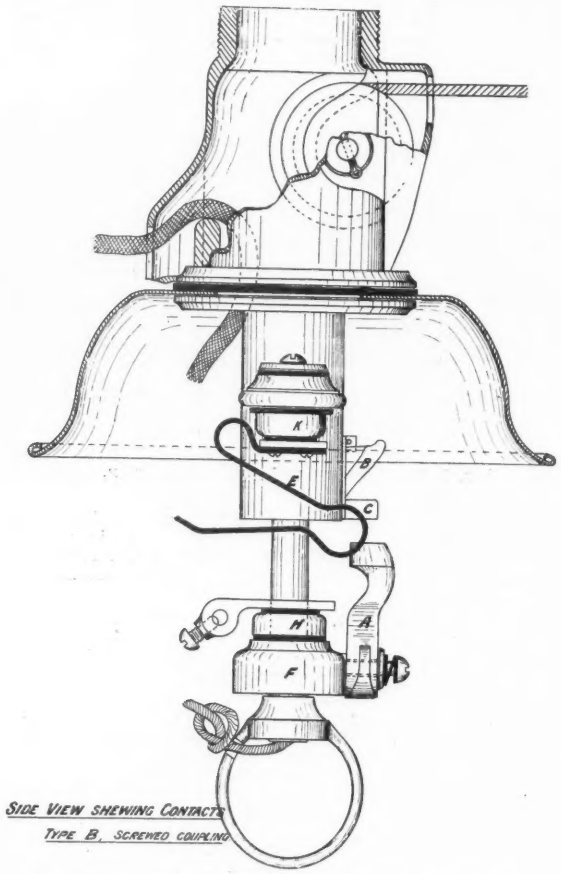


Fig. 173.—Arc Lamp Lowering Gear for Works, &c.

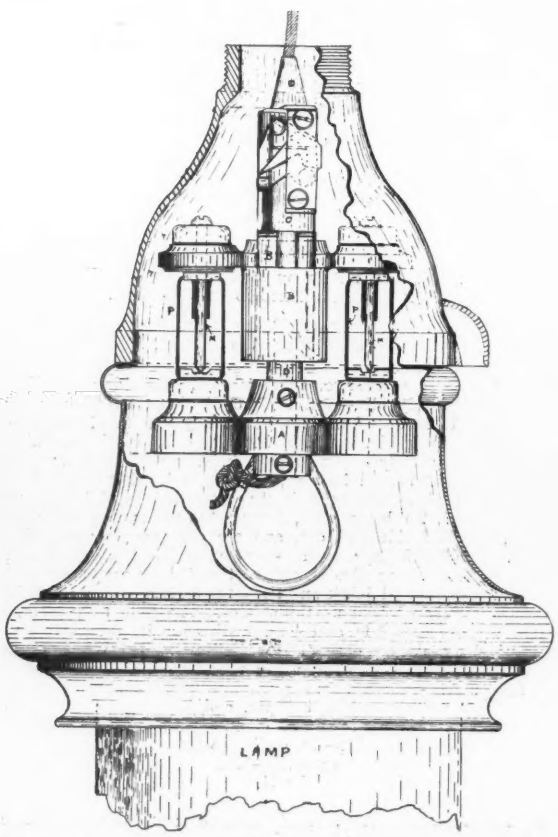


Fig. 174.—Lowering Gear for Street Lamps.

Western Electrical Appliance Co., Cathcart, Glasgow, and is chiefly meant for private installations, works, docks, warehouses, &c. We understand that it is considerably cheaper than their No. 1 type, which we illustrated in a former issue.

There are no working parts out of reach. The suspension is got by an inclined edge hook, made of gun-metal, which travels round and through inclined studs and rests on a projecting ledge. A stop action is provided on the contacts. The latter are made of phosphor bronze, and give a firm sliding contact (see fig. 173, page 534). We also illustrate (fig. 174) another ingenious and neat design which is made by the same firm. It is meant to supply a cheaper type for street and all general installations. The only moving part is a revolving stud collar, which oscillates back and forward round an inclined tongue. The contacts are all of the clip type, made of strong phosphor bronze, and the insulation is of English cream porcelain and mica.

This firm also makes a patent pulley chain protector for inserting into swan-neck bracket tubes, and various designs of winches with patent removable brake handles, pulley couplings, and all fittings required for lowering gear.

Anyone interested in this class of work should write for their catalogue and particulars.

Westinghouse Small Motors and Accessories.

Small motors are daily becoming more popular, and the range of adaptability of the Westinghouse small motor is practically unlimited, as the accompanying illustrations indicate. Now that

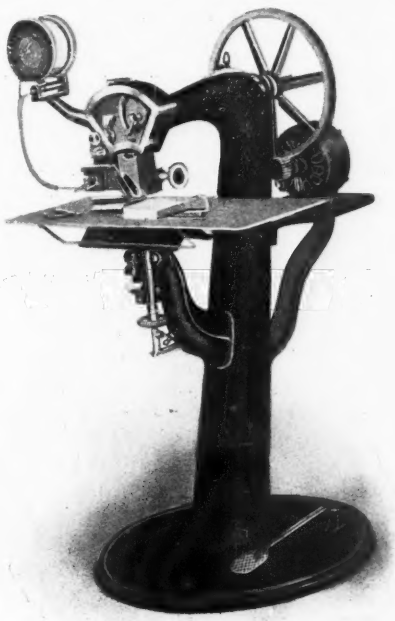


Fig. 175.—Westinghouse Motor Driving Book-Binders' Wire-Stitching Machine.

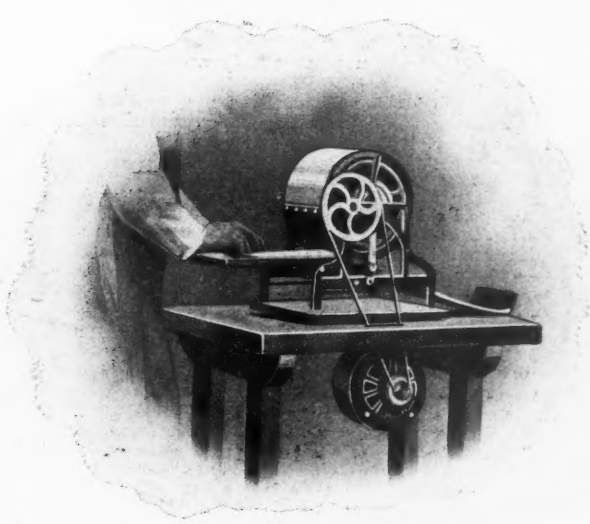


Fig. 176.—Motor Driving Neostyle.

supply companies are showing greater enterprise in bringing electric power to almost everybody's door at a reasonable price, and are pushing its claims upon the attention of consumers, there is a satisfactory advance in the use of motors for many kinds of work in the home, office, or workshop, including many operations, which are now tediously done by hand. The four small motors shown

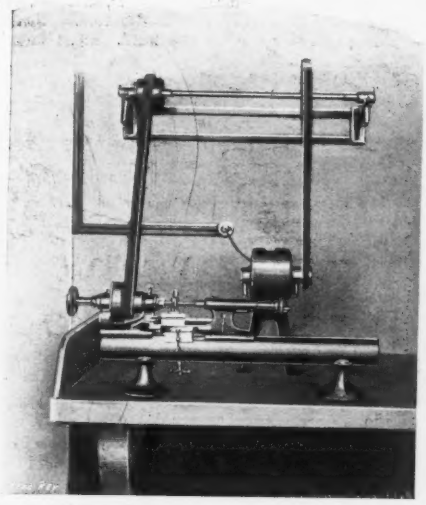


Fig. 177.—Motor Driving Jeweller's Lathe.

Fig. 178.—Motor Driving Coffee Machine.

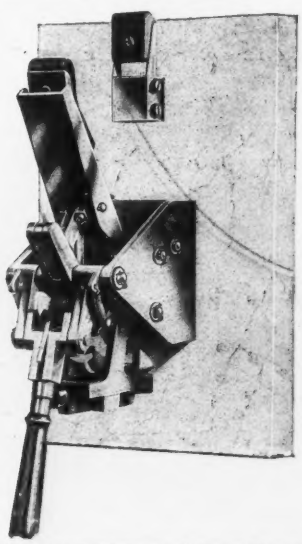


Fig. 179.—Westinghouse Circuit-Breaker.

herewith are of the British Westinghouse Co.'s manufacture. They are made A.C. or D.C. in sizes of from $\frac{1}{10}$ H.P. upwards, and are designed for considerable overload. The A.C. motor is of the

single-phase induction type, with split-phase windings, and a self-acting friction clutch by which the load is taken up after the motor has attained normal speed. The direct-current motor is either shunt or series, with practically sparkless commutation at all loads.

The company also supplies electrical details, accessories and fittings of every description—circuit-breakers, switches, distribution boards, &c., for lighting and other contractors. Some of these embody features of a new and special kind. The circuit-breaker shown (fig. 179, p. 536) is designed to meet the demand for a reliable circuit-breaker at low cost. It is made in one-, two- and three-pole forms for use on circuits not exceeding 750 volts, and is supplied with overload release only, or with overload and no-voltage release. For no-voltage release an additional attachment is added, which is electromagnetic and easily adjustable.

The light-reducing switch illustrated in fig. 180 is essentially a wire resistance, cut in or out of circuit by a contact arm. The switch is suitable for lights up to 200 c.p.

We also illustrate in fig. 181 the parts of a patent non-interchangeable cut-out or fuse supplied by the Westinghouse Company. This is of neat appearance, and its design embodies several new features. By means of a numbered brass ring, shown at the right of the illustration, the fuse can be adjusted for different amperages between 0 and 40. If adjusted for, say, 15 amperes, connection between the contact surfaces can be made only by means of a 15-amp. fuse plug. There is no possibility of inserting a wrong plug in circuit. A small window in the porcelain block shows whether or not the fuse has blown.

Fig. 180.—Light-reducing Switch with Cover Off.

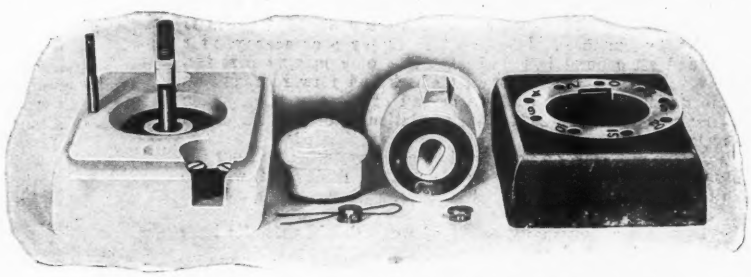


Fig. 181.—Westinghouse Non-interchangeable Cut-out or Fuse.

Wandsworth Plug and Switches.

The Wandsworth Electrical Manufacturing Co., Ltd., who have recently moved to larger works in Ludgate Hill, Birmingham, to cope with the greatly increased demand for their manufactures, are now placing on the market several new accessories for lighting and heating purposes, &c. Fig. 183 shows a 15-ampere flush plug, for which a large demand is anticipated for radiator work, &c. It is fitted with solid block contacts, has a neat appearance, and is well finished. This pattern is also stocked in 5 and 2½-ampere sizes.

Their No. 15 patent tumbler switch is now in use on Admiralty, County Council and Metropolitan Asylums Board works, and is specified by leading consulting engineers in the country. The 5-ampere patent two-way switch (fig. 182) is claimed to have a "sweet and positive" action, and large break, especially between opposite contacts when changing over. The arm or brush is insulated at either end with best quality ebonite. They claim for their two-way switch a larger break "than any other 5-ampere two-way on the market."

They have also large and varied patterns of electrical accessories of all kinds, particulars of which will be found in their list, a copy of which can be obtained upon application. The firm has a London depôt at 15, Newman Street, Oxford Street, W. (London Electrical Fittings Co., Ltd.).

Premier Accumulators.

The Premier Accumulator Co., Ltd., of Cattle Market Road, Northampton, have sent us an illustrated leaflet relating to their Planté plates. This plate is an entirely new design, and is claimed to be equally strong in all directions of the plate, so that the tendency to buckle or grow is impossible. The plates are claimed to be the thickest and heaviest on the market, and, owing to their unique design, are specially strong, and as the life of a Planté plate depends, to a large extent, on the thickness and weight of metal in each plate, it will thus be seen that these have a greatly-increased life. These plates are being continually supplied for corporation town lighting, electric tramway systems and private installations for country house lighting.

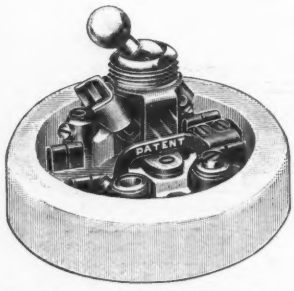
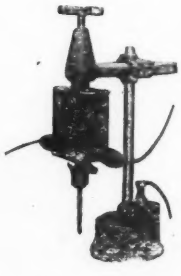


Fig. 182.—5-ampere Two-way Switch.

Fig. 184.



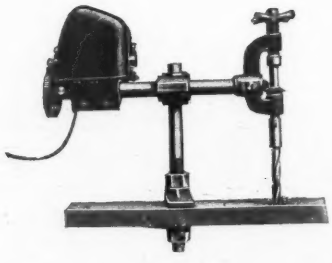


Fig. 185. Fig. 186.

Kramos Electric Drills.

Fig. 183.—15-ampere Flush Plug.

Devonport Exhibition.

At this Exhibition, to which we have already referred, we are informed that Messrs. W. C. Heath & Co., electrical contractors, of Plymouth, are exhibiting various electrical supplies. In addition to a range of Ediswan instruments and desk fans, &c., they are showing Ediswan radiators. Ediswan-Carbone flame and radiant enclosed arcs are also on view.

Kramos Electric Drilling Equipments.

We illustrate above some of the latest drilling equipments of Messrs. Kramos, Ltd., Bath. They are now acknowledged to be an essential part of every up-to-date machine shop, and remarks as to their general utility are, therefore, unnecessary.

Fig. 184 illustrates the Kramos sensitive electric bench drill which consists of a Kramos drill rigidly held in a special pillar and provided with a rising table, actuated by a lever. The feed obtainable is 3½ in. This type is particularly useful for bench work and similar purposes, and is made in several sizes for holes from $\frac{3}{8}$ in. to $\frac{7}{8}$ in. in steel.

It is often necessary to use a self-contained electric drill-press, and to meet the demand which has been found for these machines, a special type has been constructed and is illustrated, in fig. 185. It consists of

a standard self-contained electric drill head in a special suspension device attached to the spoon-shaped arm of the drilling pillar. These special devices can be attached to either standard or special pillars as desired. The feeding pressure is obtained by means of a feed wheel provided at the top of the motor. These appliances are made for holes from $\frac{3}{8}$ in. to $1\frac{1}{4}$ in. into steel, and are supplied complete with magnetic or ordinary pillar as desired.

Fig. 186 illustrates a tool which will, we think, be of interest to motor-car builders and constructional engineers. It was built for use in instances where an ordinary electric drill is not powerful or speedy enough to do the desired work, or where such a drill cannot be used owing to the trouble attached to fixing ordinary drills and pillars in a horizontal position, as will be seen from the illustration. The whole equipment can be clamped to any girder and then constitutes a radial drilling machine.

The capacity of the machine is $\frac{3}{4}$ in. holes in steel at 150 R.P.M., and it can be supplied with a magnetic pillar instead of the ordinary clamping device if desired.

The design and construction both of the electrical and mechanical portions are stated to be solid and substantial throughout.

Messrs. Kramos have just published a complete catalogue dealing with their manufactures, in which there are described amongst other machines, portable electric hoists and transporters, &c. They have just redesigned these appliances, and are now supplying an electric hoist which embodies three patents, and for which they claim numerous advantages over existing types.

The Weston Standard Portable Multimeter.

The Multimeter of the Weston Electrical Instrument Co., of Audrey House, Ely Place, Holborn, W.C., is an instrument possessing a wide range of usefulness to the electrician, being usable as a direct-current voltmeter, milli-voltmeter, ammeter, mil-ammeter, ohmmeter, ground detector and Wheatstone bridge.

The part of the Multimeter for use for the first four purposes is similar in electrical and mechanical construction to the well-known Weston portable direct-current instruments, but it differs from the regular form in that a special movable coil is employed in the Multimeter, which adapts it better to the numerous requirements of the instrument.

The Multimeter consists of a Weston type Wheatstone bridge, a battery of 12 silver chloride cells, and an indicating instrument with detachable shunts. The calibrated scale of the instrument has 160 divisions, with the zero placed at 10 divisions from the end, so that when the instrument is used as a galvanometer in connection with the bridge, both positive and negative deflections can be observed.

For the measurement of very small currents, the instrument can be directly-connected and used as a mil-ammeter; for measuring larger currents, three shunts of 1·5, 15 and 150-ampere capacity are supplied. The voltmeter ranges are respectively for ·075, 3, 150 and 750 volts.

The Wheatstone bridge consists of a rheostat with three groups of coils, adjusted to units, tens and hundreds, aggregating 999 ohms, and a set of five ratio coils. All the conductors and plug receptacles are placed under the rubber top with a view to safeguarding the insulation resistance, and the battery is enclosed in a separate compartment.

A diagram of connections and book of instructions are supplied with each multimeter, and the latter is guaranteed to be correct to within one-fifth of 1 per cent., with the exception of the bridge measurements, which are accurate to 1 per cent.

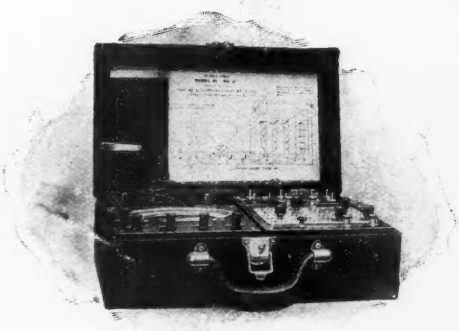
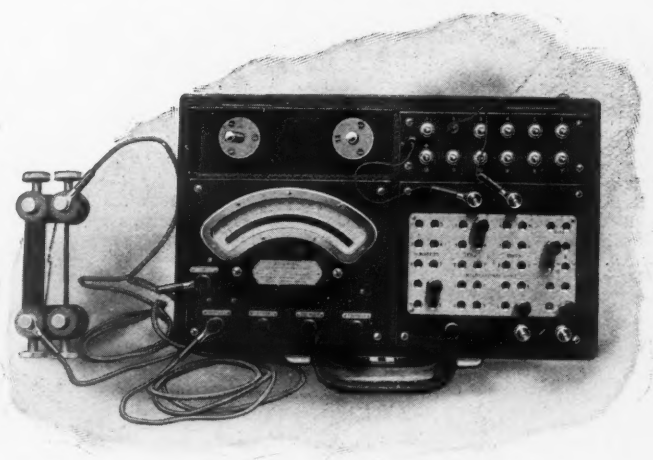


Fig. 187.



Weston Portable Multimeter. Fig. 188.

Eclipse Arc Lamps.

Mr. G. Braulik, 217-218, Upper Thames Street, London, E.C., gives prices and particulars of his "Eclipse" type of flame arc lamp for the 1907-8 season in a new list just issued. He has also published a circular giving new prices of his patent arc lamp couplings. The present "Eclipse" lamp, fig. 189, has, we understand, been sold in large quantities to corporations and contractors, some hundreds having gone to the West Ham Corporation alone within the last year. It is claimed to embody some of the most up-to-date improvements, which are the result of exhaustive tests and experiments. The most important of these improvements are the new shunt interrupter, which automatically cuts out the lamp when the carbons are burnt out, the simplicity of construction of the lower parts of the mechanism, and the absence of all impediments to cleaning and trimming, such as blow magnets, contacts, &c. In the arc lamp couplings list there are shown the "No. 773 devices," which have patent rope release. These couplings are of the latest improved type.

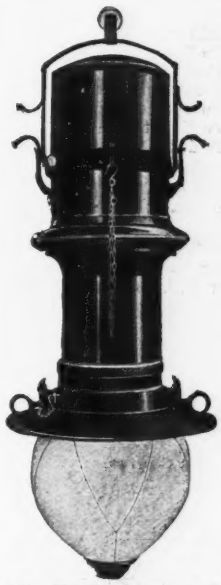


Fig. 189.—The "Eclipse" Lamp.

Ward-Leonard Motor Starters.

Messrs. Geipel & Lange, of Vulcan Works, 72A, St. Thomas Street, London, S.E., have just issued to the trade a price list describing various improvements in Ward-Leonard motor starters, which are widely used in this country.

"The Fool Proof" type of motor starter which is coming into more extensive use has, as its special feature, an overload release which is so interlocked with the arm of the starter that should an overload occur during the starting operation, the circuit is opened by a circuit-breaker independently of the starting lever, and thus prevents damage to both starter and motor. It further provides protection while starting, by preventing a too rapid cutting out of resistance, and renders it impossible to start the motor when the connections are incorrect or too great an overload exists. A time limit can be fitted to this circuit-breaker.

A further new improvement consists in the use of a no-voltage release, which is not, as usual, dependent on the field strength for its efficiency in holding the contact arm in the running position. The coil is connected directly across the mains, so that it holds the

arm of the starter regardless of the strength of the field; at the same time it is arranged to release when the armature falls below half-speed. This is designed to overcome the objection where motors are regulated by inserting resistance into the field circuit, which often causes excessive weakening of the no-voltage coil.

Renewable contracts are fitted to every size; efficient magnetic blow-outs are fitted on the contact and circuit-breaker arms of starters above 10 H.P.; efficient leading fingers and spark-takers are arranged to avoid any possibility of deterioration to the working contacts of starters below 10 H.P. It is, of course, known that the leading feature of the Ward-Leonard starter is the effective protection afforded to the resistance material, this being enclosed in a hermetically-sealed case and embedded in sand, which, whilst providing a protection against corrosion and oxidation, affords an effective means of cooling the resistance material rapidly, thus enabling heavy overloads to be carried for short periods without any injury.

"Single Lever" Telephone.

The "Single Lever" automatic intercommunication telephones (patent) of The Sterling Telephone and Electric Co., of 200, Upper Thames Street, E.C., have the advantage of automatic replacement without requiring a separate selecting lever for each line.

Fig. 190.—Single Lever Wall Telephone.

It is only necessary to move the line selector when originating a call. Calls may be received and answered irrespective of the position of the line selector, and after conversation is finished, the act of replacing the hand combination automatically disconnects the switch. It is impossible to inadvertently make contact with two

Fig. 191.—Single Lever Telephone. Desk Type.

lines. The selector switch contacts are enclosed in the instrument case, and are thereby protected against dirt.

The great advantage of the instrument is that there is only one movement for each instrument, irrespective of the number of lines, as against 5, 10, or 15 movements per instrument, as the case may be, of the older style.

Bonnella's Devices.

Messrs. D. H. Bonnella & Son, Ltd., of 58 and 60, Mortimer Street, Cavendish Square, London, W., are supplying a new barrel push (fig. 194) which has been made up specially for flush work, and is provided with a $\frac{5}{8}$-in. thread, the same as an ordinary tumbler switch,

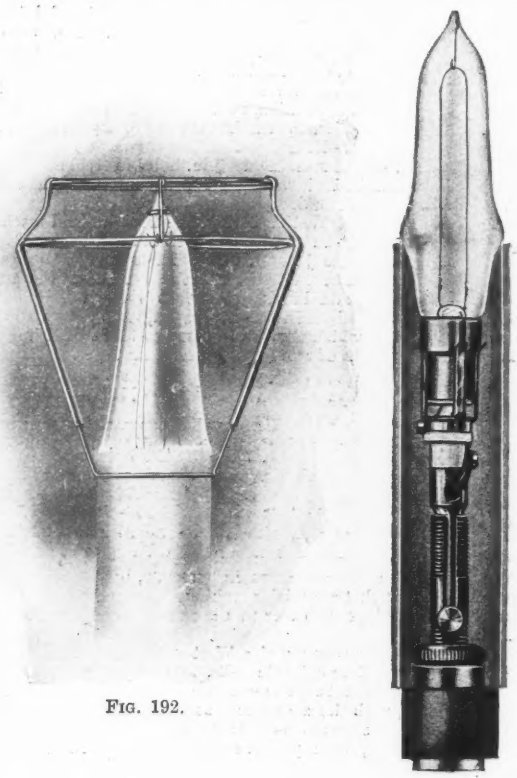


Fig. 192.

Fig. 193.

so that it can be fitted into standard switch plate or cover. Separate terminals are provided for each wire. In fig. 193 we illustrate an improved type of their Shadoless candle fitting, made with telescopic adjustment so that perfect adjustment can be made to any fitting. Fig. 192 represents a new type of shade carrier which is specially

Fig. 194.

suited for Shadoless candle fittings, but owing to the possibility of it being adjusted to any required length it is suitable for any type. It also claimed to possess the advantage of not throwing shadows when fitted on the lamp. The firm has also designed a new type of flush Simplex holder for sinking flush into walls or ceilings, specially suited for ship work, ceiling lights, &c., where space is limited. A number have been supplied for the latest Cunard liner.

The Chicago Subway.—The remarkable system of underground goods railways of Chicago is approaching completion, and according to the *Electrical World* it is officially estimated that by January 1st the daily movements in the tunnel will be 10,000 loads, or between 20,000 and 30,000 tons of freight daily. The daily mail transferred aggregates 32,000 to 35,000 pouches. The subway consists of 51 miles of bore under the "loop," duplicating 18 streets east and west, and 12 streets north and south, with 325 street intersections, at an average depth of 42 ft. except at the river approaches. There will be 3,000 cars and 130 electric locomotives instead of 1,200 and 80, respectively, at present. The average speed of a tunnel train is 8 to 10 miles an hour, including stops, with a possible maximum of 15 miles. General manager Kenyon has arranged a duplicate loop system of operation whereby 30,000 cars a day, with 90,000 to 100,000 tons of freight, might be moved every 24 hours by three shifts of employés. Block signals and automatic switches will be introduced. All tunnel track is laid with 56-lb. rails, with a gauge of 2 ft. At each street intersection there are four three-way switches.

Electric Tramway Signals.

Mr. E. Dewhurst, of Mount Street Works, Preston, has recently introduced a patented system of automatic electric signalling for the protection of single line sections of tramways.

The system can be adapted to meet the conditions existing when either a single or several cars simultaneously are travelling in one direction.

Fig. 195.—Tramway Signal Box.

Taking the case of a single-car system in the first instance, the complete outfit consists of two signal boxes (usually attached to tramway standards as shown in fig. 195) which are interconnected (by three wires) and also connected to four overhead skates in the trolley wires, situated two at either end of the section of single line to be protected.

Each signal box is fitted with a bull's-eye and a lamp behind, the latter being in series with the corresponding lamp in the other box; both lamps have resistances in series with them, and are always burning, but below their rated voltage.

The signal box contains a triple-ended lever, two ends of which are controlled by solenoids, and the third, having a red disk at its extremity, oscillates so as to move in front of the lamp behind the bull's-eye.

In operation, a car entering the section makes contact with one of the skates by means of its trolley head, current passing to the distant signal box, where it energies one of the solenoids, and throws the red disk in front of the bull's-eye lamp, blocking that end of the section. As the car leaves the section, it makes contact through the other skate, energising the other solenoid, which in turn draws the red disk away from the bull's eye.

The contact skate (fig. 196) consists of an aluminium bar, to the ends of which are fitted globe strainers bolted to standard ears. A grooved metal plate (wired up to the signal box) is suspended from the aluminium bar, just clear of the trolley wire, but near enough for the trolley head to make contact with it.

To meet the case of several cars passing over a single section simultaneously, Mr. Dewhurst has designed a further signalling device, which, as it includes the solenoid action previously referred to, requires but little further description.

Fig. 197 shows this multiple signalling device, the two solenoids being visible, the cores of which are connected to a rocking lever.

The latter lever is provided with two pawls, which operate two ratchet wheels in opposite directions. An aluminium disk, mounted on the ratchet spindle, is provided with a series of signal glasses round its periphery; the first is unglazed, so as to show a white light, and the remainder contain red glass.

The operation of this device resembles the single car signal, as on being energised by a car proceeding through the section, the solenoids turn the aluminium disk one space forward and one space backward, thus showing a red and white light respectively, when the car enters and leaves the single line.

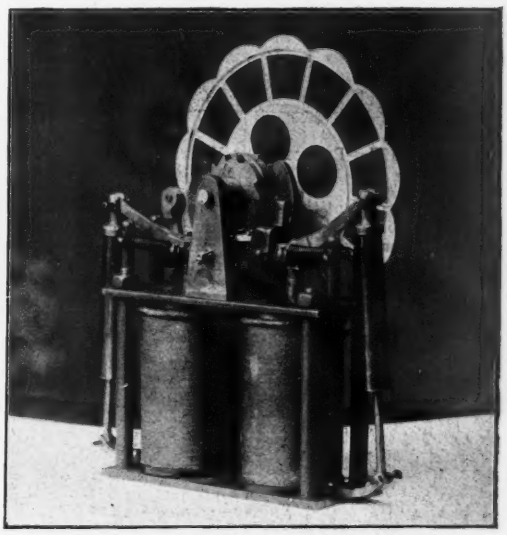


Fig. 197.—Multiple Signalling Device.

But when a succession of cars pass over the section, the aluminium disk at the far end moves one space forward for each car entering, and correspondingly one space backward for each car leaving, thus finally showing the white or clear signal when the section is empty.

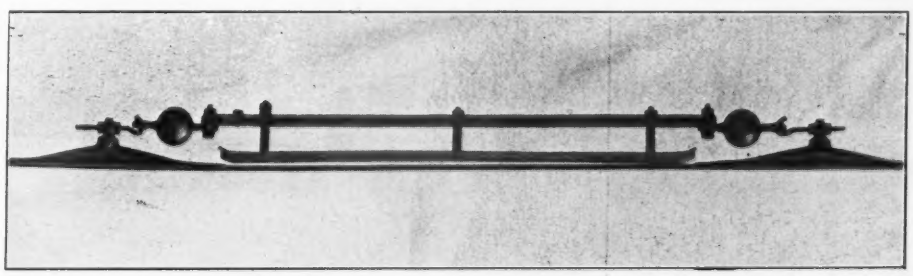


Fig. 196.—Contact Skate for Tramway Signal.

We understand that this system of signalling has been successfully adopted on several important tramway systems, and as it has been on view at the Midland Hotel, Manchester, this week, during the Municipal Tramways Conference, many engineers and managers will, doubtless, have become acquainted with its interesting features.

Mining Machinery.—Referring to the article by "Gluckauf" on explosion-proof electrical mining machinery in our last issue, Messrs. Vlasto, Clark & Watson, of London Road Bridge, Stockton Heath, write, saying that they have just standardised a switch which complies with all the requirements specified. It is of similar pattern to the starting switch illustrated on p. 528 of this issue, suitably modified, and placed in an oil tank, from which it can easily be lifted entire to make adjustments. Only mica is used for insulation. Controllers are also made of the same pattern, but longer. The price is much below that mentioned by "Gluckauf."

Moscicki Condensers.

Electric condensers have long been used for storing small amounts of energy, and for that purpose have given satisfaction, the cost being of little importance. Their application with a view to

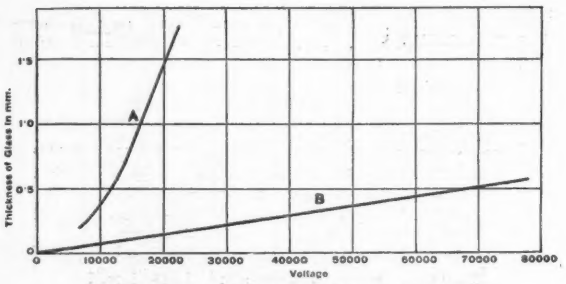


Fig. 198.—Perforation Voltage of Glass.

the storing of large quantities of energy is, however, a quite different matter. It is obvious that an economical use of condensers can be effected only by means of high pressure; low-pressure condensers, in addition to occupying a larger space for the same amount of energy, would be much more expensive, as the energy stored is proportional to the square of the pressure employed.

In the form generally adopted for laminated condensers, conditions are produced that have an adverse influence upon their resistance to perforation, so that they may be perforated at comparatively low pressures, while the same material under more favourable conditions would be able to withstand much higher pressures. The conditions necessary for efficient cooling are at variance with those required for efficient insulation, and wide variations of temperature have a detrimental effect. In fact, as the resistivity of insulators decreases for augmenting temperatures, a conduction current resulting in energy losses will be produced in addition to the charging current.

In connection with the installation of apparatus intended for the production of nitric acid from atmospheric air, conducted by Mr. J. Moscicki, of Fribourg, Switzerland, in the testing laboratory of the Société de l'Acide Nitrique, the whole process was nearly rendered impracticable, for want of suitable high-pressure condensers capable of working continuously with oscillating discharges at a normal pressure as high as 50,000 volts. Moscicki experimented with high-pressure condensers obtained from various firms, all of which showed the usual defects of laminated condensers, deteriorating in a short time.

Careful researches accordingly became necessary upon numerous insulating materials, with a view to devising a satisfactory type of condenser, and it was found by a series of scientific tests that a dielectric substance of given thickness could stand different pressures according to the conditions under which it was used. The portion of the dielectric material supporting the outer edge of the armature, for instance, was shown to be exposed to considerably higher strains than any other part of the same insulator, lying within the covered surface. This behaviour is illustrated by the curves of fig. 198; one of these (A) shows at what alternating voltage glass of a certain thickness is perforated in the neighbourhood of the periphery of the armature, while the other curve (B) indicates the voltage to which the pressure must be raised in order to perforate the same glass in the interior of the armature. A striking difference in the resistance to perforation according to position will be noticed; whereas in the interior of the armature the thickness of the glass and the perforation pressure are connected by a simple law of proportionality, the thickness at the periphery increases as the square of the pressure. In one case, for instance, a certain glass plate 0·55 mm. in thickness, placed under the periphery of the armature, was perforated by an alternating pressure of 12,500 volts, while the same kind of glass, of the same thickness, on being placed in the interior of the armature, required an alternating pressure of about 75,000 volts to perforate it.

As the periphery of the armature is most exposed to the risk of perforation, the insulator must be made much stronger in the peripheral parts, while the dimensions of the periphery should be reduced as much as possible.

This was adopted as the guiding principle in the design of a new condenser system. It was found that the most convenient form to be given to the dielectric was that of tubes. Moreover, a convenient cooling, improving the efficiency of the condenser, is rendered possible by using electrolytes as armatures. With this system the dielectric material can be considerably reduced, so that its volume for the same power will be much less as compared with other systems. Further, the cost of such a condenser is much lower than that of a laminated condenser.

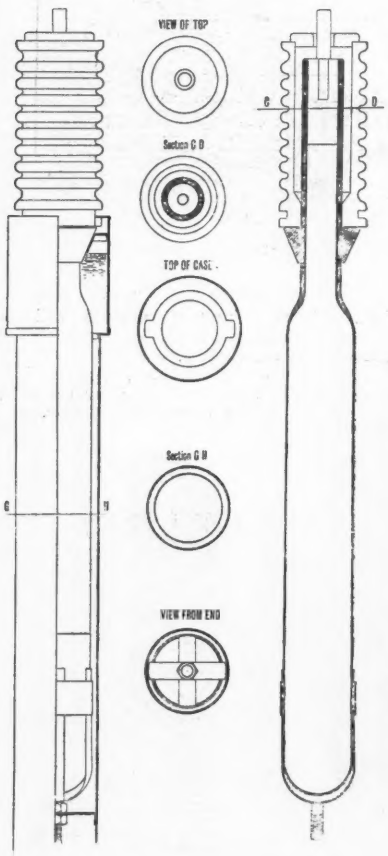


Fig. 199.—Details of a Moscicki Condenser Element.

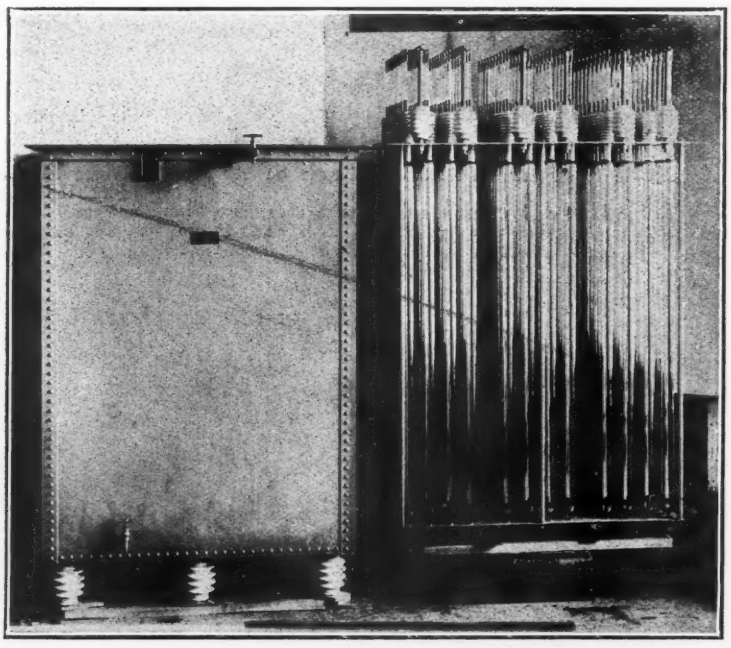


Fig. 200.—Battery of 120 Moscicki Elements, without Outer Tubes.

Fig. 199 shows how the principle is applied; the thin glass tube is closed at one end and is silvered inside and out, with a thick layer of copper superposed. The edges of the two armatures are at the neck of the tube, where the glass is greatly thickened. Reliable terminals are attached to the armatures, the inside at the top and the outside at the bottom, and the neck of the tube is sealed into a grooved porcelain insulator fitted with a bayonet socket, which couples with a brass or iron tube, closed by a rubber plug. The annular space between the tubes is filled with a non-freezing mixture of water and glycerine, which cools the condenser. Each element is provided with a Mordey fuse at the top, so that the failure of a tube results in the isolation of that tube without affecting the rest. The top and bottom terminals are connected to bus-bars.

Whenever condensers are used with alternating currents of relatively low pressures, below 5,000 or 6,000 volts, it proves advantageous to raise the pressure for the condensers by means of transformers. The efficiency of the new condensers is at least 90 per cent.

The above condensers, now manufactured by the Société Générale des Condensateurs Electriques, Fribourg, Switzerland, are available for reducing the inductance drop, which occurs in almost all

alternating-current systems, especially when asynchronous motors are connected thereto. Messrs. Isenthal & Co., of 85, Mortimer Street, W., who are sole agents for these condensers for the United Kingdom and the Colonies, are introducing them for this purpose, and fig. 200 shows a large battery removed from the tank—this set being of the liquid-armature type. There are 120 tubes in the battery, which measures 960 × 760 × 1,350 mm. high, and can deal with 60 K.V.A. at 20,000 volts. To facilitate the determination of the best number of condensers to use in a given case, Messrs. Isenthal have got out a pamphlet containing tables, showing the relation between the size of the battery and the increased output in K.V.A. obtained, for any stated degree of improvement in the power factor. It is not generally advisable to increase the power factor above 0·9 or 0·95 by this means, as the

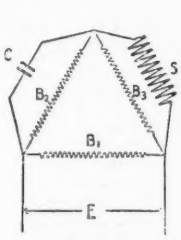


Fig. 201.

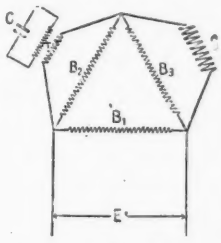


Fig. 202.

number of condensers becomes too great; but it is always possible to increase it from, say, 0·7 to 0·9 with economy. By improving the power factor with condensers at the motor end of a feeder, not only are the C^2R losses in the line and generator diminished, but also the regulation of the latter is benefited and the excitation losses are reduced; the plant also costs less for a given output.

With the aid of high-pressure condensers, the use of three-phase motors with all their good qualities has been rendered possible on lines supplying single-phase current. The diagram, fig. 201, shows the connections for supplying a motor with three-phase current from a single-phase generator at a pressure of 5,000 volts or more; B_1, B_2, B_3 are the three-phase stator circuits, C the condenser, S a choking coil, and E the single-phase power supply. If the motor is supplied at low pressure from a transformer, the latter can be of the three-phase type, and B_1, B_2, B_3 the primary windings. If, again, the supply is at low pressure, a small transformer is used to raise the pressure on the condenser terminals to 10,000 or 15,000 volts, as shown in fig. 202.

The condenser and choking coil, in any case, have each a rating equal to 60 per cent. of that of the motor, and the latter should be of the slip-ring type, with a starting resistance.

Other important applications of the condensers are to the protection of high-pressure overhead lines and of tramway motors, wireless telegraphy, X-ray work, and electro-therapeutics.

Venner Shop-Window Switch.

An interesting device that is being put on the market by Messrs. Venner & Co., of 6, Old Queen Street, Westminster, S.W., is

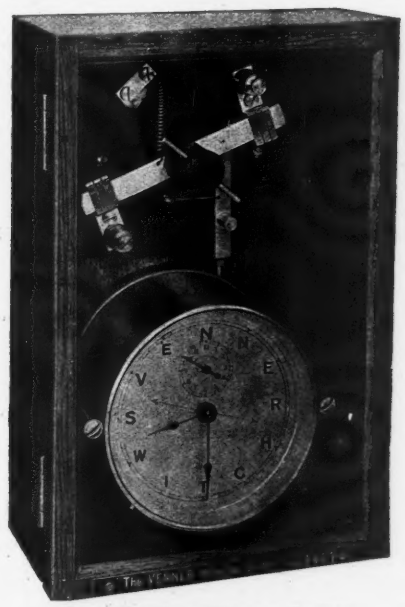


Fig. 203.—Shop-Window Switch.

illustrated in fig. 203. It is a switch by means of which shop window lights may be turned off automatically. It will switch off 70 8-C.P. lamps, and is set for that purpose in just the same manner as an ordinary alarm clock. For electric light consumers who wish to leave their lamps on after shop-closing hours, for advertisement purposes, it should be a useful device. It is supplied in a solid oak case and weighs 3¼ lb. Messrs. Venner will send a supply of circulars without their name on to any contractor who makes application. They also have show-cards in preparation.

New Radiators.

Messrs. H. A. Jackson & Co., Caxton Works, Salford, Manchester, have a number of new designs in art hand-beaten

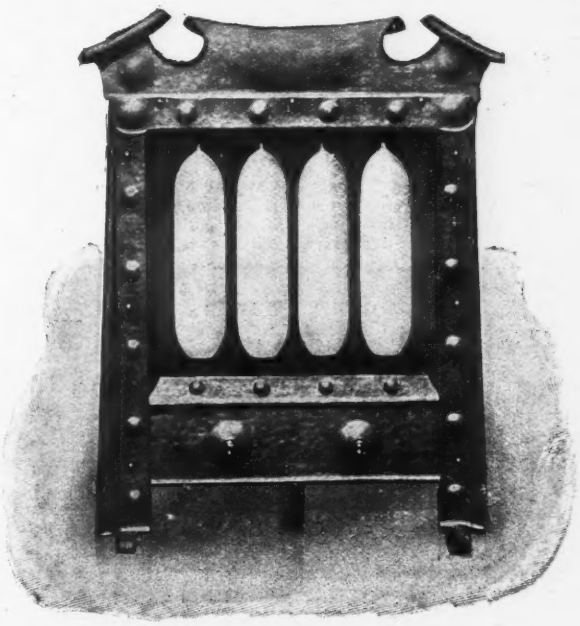


Fig. 204.—Jackson Electric Radiator.

metal radiators, one of which we illustrate above. They also make a speciality of electroliers in similar metal work, all of which is done by hand.

Ediswan Supplies.

The Edison & Swan United Electric Light Co., Ltd., of Queen Street, E.C., are placing on the market several new fittings

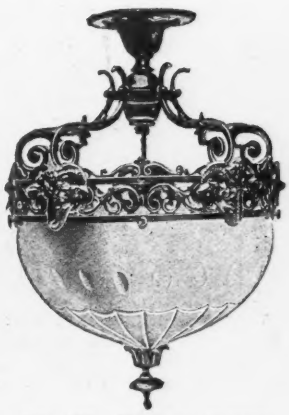


Fig. 205.—Ediswan Ceiling Fitting, New Design.

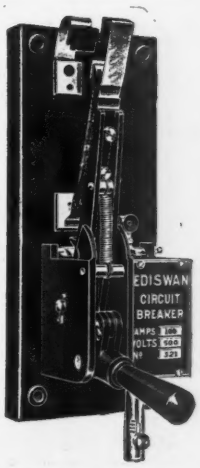


Fig. 206.—Ediswan Circuit-Breaker

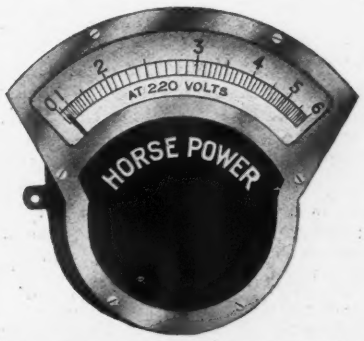


Fig. 207.—Ediswan Horse-power Meter.

and accessories, three of which we illustrate. Fig. 205 shows a new design of ceiling fitting. Fig. 206 represents the "Ediswan" circuit-breaker, which is designed to automatically open the circuit in case the current passing equals or exceeds the amount for which the instrument is set, or in case of a short-circuit. It is fitted with substantial laminated H.C. copper contacts of self-cleaning press-on type, with renewable carbon tips, fitted to light springs, well above the main current-carrying parts. The framework consists of stout castings, stove enamelled, giving a neat finish to the assembled parts. The base is of best selected enamelled slate, free from metallic veins. The handle is loose, and independent of the switch arm, so that the breaker cannot be held in circuit when an excessive current is flowing. In action, the switch is held in by a knuckle lever against a dead centre, which is "released" by the tripping device, through the latch. Owing to the link action, the switch is firmly locked in position when "On," and cannot be jarred from its contact by even excessive vibration. The plunger actuated by the coil operates the trip latch in the switch mechanism; and this can also be released by a push button above the coil.

In fig. 207 we show an "Ediswan" power gauge for electric motors, being one of a special line of sector-pattern moving-iron type for D.C. or A.C. The case is of best quality cast-iron, with nickel facings, and is guaranteed dust-proof. The movement is jewelled, with dead-beat action, and pivot friction is stated to be practically eliminated. Price lists of the circuit-breakers and meters have just been issued.

MANCHESTER AS A CENTRE FOR AN ELECTRICAL EXHIBITION —ITS ADVANTAGES.

By ERNEST T. WILLIAMS.

The leading article in the Electrical Review dated August 23rd dealt with the question of "The Electrical Industry and Next Year's Exhibitions." It pointed out

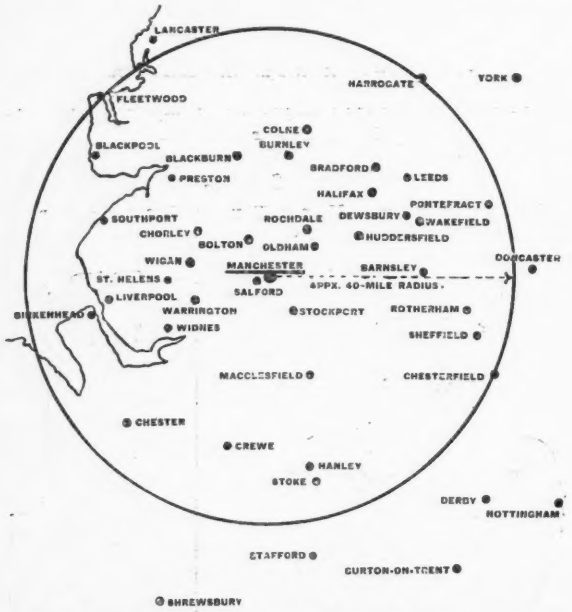


Fig. 1.—Approximate Area and some of the most Important Towns within a Circle of 40 Miles Radius from Manchester.

that two exhibitions, viz., the Franco-British and the Manchester Exhibition, were to be held, and gave sound reasons to show that the latter would probably give better results to exhibitors than the former.

Without wishing to detract from London as an exhibition centre, it may be useful to look into the claims of Manchester under this heading.

It is well known that Manchester is the centre of a great industrial area, but the impression is usually a vague one, and it is not until we closely examine the district that we realise the extent to which this is the case.

Names often do not convey much meaning, and figures are usually only of comparative value, so that really to know a district, it is necessary to have been in it often and for some time; however, for the benefit of those who have not had this opportunity, fig. 1 is given showing the more important towns within 40 miles of Manchester.

To deal with each town separately and mention only its electrical engineering interests would take more space than could well be given to this article, but a glance through the tables of electrical undertakings published by the Review, or through an electrical directory, would show how great and important the electrical interests are. In addition to these there are innumerable other engineering and manufacturing concerns in which the possibility of electrical application is being realised.

An electrical exhibition should have for its principal object the educating of those who are not yet within the pale of its influence, as well as those who are directly or indirectly interested, and from this standpoint Manchester offers exceptional possibilities.

Many directors and managers in the district visit Manchester very often, and would probably take the opportunity of visiting an exhibition on one or more of these occasions, whereas if they had to make a special journey, or a long one, they would not be able to spare the time for this purpose.

Apart from its immediate district, Manchester is an excellent centre for the large towns of the British Isles as a whole. Reference to fig. 2 will show that Manchester is within 200 miles of most of the large towns, including London, Newcastle, Edinburgh, Glasgow, Belfast, Dublin, Birmingham and Bristol; it is also a port.

This has two advantages, viz., the time and cost of visiting an exhibition from any place are not excessive, and the cost of freight for the heavy goods of exhibitors is more equalised.

Fig. 2.—Approximate Area within a Circle of 200 Miles Radius from Manchester.

Apart from the foregoing, it may be mentioned that Manchester is an excellent business town, an item of considerable importance when a large amount of money is spent on an exhibit. It has an exceptionally good train service to all parts of the kingdom, and a site near the City will probably be selected, thus reducing to a minimum the time taken in travelling. The large number of electrical undertakings alone, in the district, would warrant an exhibition being held in Manchester, on a large scale, and when the indirect interests are considered, there seems little reason to doubt that the results would be profitable. So far as the general success of the exhibition is concerned, it augurs well that the local authorities have taken the matter up, and it but remains for the electrical industry to give the effort the support it deserves, to equal, or even surpass, the great success at Olympia two years ago. The writer would add that he is in no way interested in this or any exhibition except in so far as they are of interest to any member of the profession anxious for its welfare.

CONTRACTS OPEN.

(*Continued from page 494.*)

Paris.—October 24th. The Municipal Waterworks Department (Service des eaux, canaux et égouts) requires tenders for the supply and erection at the Austerlitz works of (1) four sets of motor-driven pumps, dynamos, &c., complete, capable of lifting 100,000 cubic metres of water per day into either of two reservoirs, or 50,000 cubic metres into both at the same time; (2) and one reserve set; (3) 10 boilers in two groups of three, and one of four. Particulars may be obtained at the Hotel de Ville.

Peterborough.—October 3rd. Feeder cables for the Corporation. See "Official Notices" September 20th.

Portrush.—November 2nd. The U.D.C. invites tenders for a complete lighting installation by means of either electricity or gas. Specifications prepared by Mr. John Woodside, A.M.I.E.E., Ocean Buildings, Belfast. Copies can be seen at the office of Council, Town Hall, Portrush.

Southampton.—The Corporation requires sundry underground cables, conduits, and earthenware troughs. See "Official Notices" August 23rd.

Southampton.—Second-hand steam generator of about 200 KW., at 420-440 V., D.C., on loan, for the Corporation. See "Official Notices" September 20th.

Spain.—September 30th. The Government powder factory at Murein requires tenders for electric motors, batteries, &c. The Junta de subrota de la fabrica de pólvera de Murein is the contracting authority.

Spain.—MADRID.—October 15th. The Post and Telegraph Department require tenders for the exploitation during 10 years of the urban telegraph system of Sevilla. A royalty of 10 per cent. is required by the Government, also a bond of 20,000 pesetas. Particulars may be obtained advisably through an agent making personal application at the Direccion General de Correos y Telegrafos, 10, Carretas, Madrid.

Spain.—MADRID.—October 17th. The Post and Telegraph authorities require tenders for the exploitation of the Alicante telephone system. The bond is 10,000 pesetas. The remarks on the Sevilla tender apply also in this case.

Spain.—(No date fixed.) The Minister for Posts and Telegraphs requires tenders for the repairing of telegraph lines as follows:—

20	tons	galvanised iron wire	5	mm.	diameter
20	"	" "	4	"	"
4	"	bronze "	2	"	"

Applications are to be made to Direccion General de Telegrafos y Correos, 10, Carretas, Madrid.

Sweden.—October 1st. The General Direction of the Canal and Waterworks at Trolhattan, Sweden, are inviting tenders for three 350-KW. continuous-current dynamos, a 4,800-ampere-hour battery of accumulators, four three-phase alternators of 11,000-kilovolt-ampere capacity, 12 relays, regulators, switchboards, &c.

Swinton and Pendlebury.—September 28th. Wiring, on the hire-purchase system, of buildings for electric light, for the U.D.C. See "Official Notices" September 13th.

Tunbridge Wells.—November 1st. 500-KW. turbine, alternator and exciter, surface condensing plant and pipe-work for Corporation electricity works. See "Official Notices" to-day.

West Ham.—October 3rd. India-rubber-covered wires and cables for six months for the Corporation. See "Official Notices" September 20th.

Willesden.—September 28th. Seven 50-KW. static transformers for the U.D.C. See "Official Notices" September 20th.

CLOSED.

Croydon.—The B.C. has accepted the following tenders:—

100 flame arc lamps.—The Oliver Arc Lamp Ltd., at £9 per lamp.
100 transformers.—The General Electric Co., Ltd., at £1 17s. 6d. each.
Lowering gear (100); tramway poles, £2 4s. each; arc lamp poles, £2 1s. each.—The London Electric Firm (Croydon).
10 tons of overhead trolley wire, at £94 10s. per ton.—Messrs. Edward Le Bas & Co.
Overhead fittings, £130 19s.—Mr. A. Wiseman.

Glasgow.—The Tramways Committee has accepted the following offers:—

Lead-covered cable.—Lahmeyer Electrical Co., Ltd.
Telegraphs for Pinkston Power Station.—Eversheds & Vignoles, Ltd.

Hackney.—The B.C. Public Libraries Committee has received the following tenders for the electrical installation of the Central Library:—

	Steel conduit.	Wood casing.	Lead covering.
F. C. Hoskins & Co.	£267	£246	£315
Tilley Bros. (accepted, subject to usual sanction)	312	274	277
G. Western & Sons	318	305	300
Pemberton, Arber & Co.	334	296	283
Smeeton and Page	336	296	290
Roger Dawson, Ltd.	347	318	328
E. Probert & Co. (exclusive of fittings)	352	302	—
F. Troy & Co.	358	324	341
H. J. Gallier	367	328	—
Vaughan & Cook, Ltd.	367	330	—
W. J. Fryer & Co.	383	340	356
Barlow Bros. & Co.	386	322	367
J. H. Golding	390	302	—
F. A. Glover & Co.	391	341	380
Sweet Bros.	396	272	358
J. O. Grant and Taylor	403	368	345
Jackson Bros.	409	352	345
Ward Bros.	415	382	380
Smith & Co.	451	360	—
Electric Installations, Ltd.	604	420	452

The Committee reporting on the matter said they had at first come to the conclusion that it was advisable to adopt steel conduits. The lowest tender for this work was that of Messrs. Hoskins. Their inquiries with reference to this firm showed that they had done no work of a similar nature, although their manager, recently in the employment of another firm, executed several important contracts. The Committee felt that this important job ought not to be entrusted to a firm who had not executed similar work, and the borough engineer considered the amount of the contract rather small for the proper execution of the work specified. The Committee had therefore decided in favour of the tender of Messrs. Tilley Bros., which was a well-known local firm and experienced in this class of work.

Heswall.—The Keighley Electrical Engineering Co., Ltd., has received an order for three electric lifts for the Liverpool Country Hospital for Children, Heswall.

Johannesburg.—At a meeting of the Committee of the Johannesburg Town Council on August 28th, it was decided to recommend the acceptance of the tender of Messrs. Reunert and Lenz for the supply of a 1,000-KW. Belliss-Vickers steam dynamo set, at a cost of £11,407, and also for the supply of boilers and appurtenances, at a cost of £5,608. It is hoped to have same running before the Christmas holidays. The recommendation was to come up for confirmation at the next Council meeting.

Maidstone.—The T.C. has accepted the tender of Messrs. John Spencer, Ltd., for steel steam pipes for the electricity works, at £106.

FORTHCOMING EVENTS.

Engineering and Machinery Exhibition at Olympia. Open until October 19th.

Saturday, September 28th.—At 7.30 p.m. Smoking concert of the Birmingham and District Electric Club, at the Colonnade Hotel, New Street, Birmingham. Chairman, Mr. W. H. Whitehouse, M.I.E.E.

Thursday, October 3rd.—At 8 p.m. At Caxton Hall, Westminster, Civil and Mechanical Engineers' Society: Presidential address by Mr. W. N. Twelvetrees.

Friday, October 4th.—At 8 p.m. At Holborn Restaurant (Kings' Hall). Electro-Harmonic first smoking concert for the season. See our "Notes" to-day.

CONTRACTORS' COLUMN.

OPENINGS FOR NEW BUSINESS.

ALVERSTOKE.—Extension of Gosport and Alverstoke Secondary School. H. A. F. Smith, architect, Star Chambers, Gosport.

AMERSHAM.—Two bungalow residences. E. T. Gilder, Amersham, owner.

HIGH WYCOMBE.—Sanatorium at Godstowe School. Mrs. Scott, owner.

ATHERTON (near MANCHESTER).—New mill contemplated by Laburnum Spinning Co.

BANGOR.—New Wesleyan Sunday Schools. W. G. Williams, architect, High Street, Bangor; R. and J. Williams, builders, Upper Bangor.

BELFAST.—New school-house in Cambria Street for the Rev. L. H. Cullen. W. D. R. Taggart, architect, 2, Wellington Place, Belfast.

BOLTON.—Additions to mill. Bolton Textile Mill Co., owners.
Business premises in Deansgate. Adamson & Barlow, owners.
Extensions to mill in High Street for Young, Ltd., cotton spinners.

BRIDPORT (DORSET).—Secondary school in St. Andrew's Road. F. Cooper, architect, 77, East Street, Bridport.

BRISTOL (STOKES CROFT).—New college to be built for the Baptist Union.
(HANHAM).—New Congregational Church (£5,000). Latrobe and Weston, architects, 20, Clare Street, Bristol.

BROMLEY.—Showroom and garage (£1,140). Dunsmore Bros., Honor Oak Park, S.E., architects.

CHESHAM.—Factory (£1,288). Stokes, Pinder and Belch, 49, Upper Baker Street, N.W., architects.

CLATTER (MONTGOMERYSHIRE).—New Council schools (£1,096). J. J. Meredith, builder.

CREWE (CHESHIRE).—Training college for 100 students with residence attached. H. Beswick, county architect, Education Department, Chester.

CULRAIN (Ross-shire).—New Carbisdale Castle for the Duchess of Sutherland.

DERBY.—Two houses and shops to be converted into one in Corn Market for boot emporium. Builder, H. Vernon, Derby.

DEVONPORT.—New theatre in Princess Street. Counties Theatres, Ltd., owners.

Conversion of Temperance Hall into Wesleyan Soldiers' and Sailors' Institute, with extensive additions (£5,000). M. Wilson, architect, Devonport.

DOVER.—Extensive warehouse premises in Market Lane. Sir R. Dickeson and Co., Ltd., owners, Dover.

DUBLIN.—Annexe to the Orange Hall, 10, Rutland Square (£2,000).

New chapel, dormitories, &c., at the Dominican Convent in Eccles Street. Doolin, Butler & Donnelly, architects, Dawson Chambers, Dublin.

ECCLES.—Extensive new premises to be built at Monton, Eccles. Write, Burgon's, Ltd., tea dealers, Manchester.

EGHAM.—Shops and houses in High Street. Mr. Powell, Egham, owner.

EXETER.—New lace factory in Cowick Street.

GLOUCESTER.—New shop and residence in Barton Street. F. Norville' owner; T. Toomey, builder, 225, Barton Street, Gloucester.

GOSPORT.—Married soldiers' quarters at Fort Monckton. H. B. Measures, Director of Barrack Construction, War Office, 80, Pall Mall, London, S.W.

GRAVESEND.—New factory for the Ermine Plate Power Co.

HERNE BAY.—Bungalow residence, Victoria Drive. A. Brandon, owner; J. Huxtable, architect, Station Road, Herne Bay.

HORWICH.—Alteration and restarting of mill. Write, R. Foster, Foster's Doubling Mill, Chorley New Road, Horwich.

HUCKNALL HUTHWAITE (Notts.).—New hosiery works for the Co operative Wholesale Society.

HUDDERSFIELD.—Bungalow residence. A. Hill, architect, 11, Thornton Lodge Road, Huddersfield.

LIMERICK.—Municipal Technical Institute.

LIVERPOOL (Toxteth).—New Technical Institute (£12,400). J. & G. Chappell, builders, County Road, Walton, Liverpool.

(Holt).—Additions to the secondary school (£1,084). Brown and Backhouse, builders, 58, Chatham Street, Liverpool.

LOFTUS, S.O. (Yorks).—Development of estate for building residences at West Loftus. Marquis of Zetland, owner.

LONDON (Aldgate, E.).—Rebuilding of branch post office. J. Wager, H.M. Office of Works, Storey's Gate, S.W.

(W.).—Buildings on site of 103, Oxford Street. Messrs. Pilditch, 2, Pall Mall East, S.W., architects.

(East Ham).—Additions to laundry in Lawrence Road. Frank Bethell, 23, Queen Anne Place, Enfield, architect.

(Tottenham).—Factory in Vale Road. W. Lawrence & Son, Mosaille Works, Tottenham, builders.

(Tottenham).—Additions to Coleraine Park school. G. E. T. Lawrence, 22, Buckingham Street, Strand, W.C., architect.

(Clapham).—Additions to laundry in Clapham Park Road. J. Garrett & Son, 17, Balham Hill, S.W., builders.

(Wandsworth).—Additions to Oak Lodge. B. Colley & Sons, 135, Portland Road, Notting Hill, W., builders.

(Streatham).—Parish hall in Tooting Bec Gardens. W. Mason and Sons, Streatham Common, S.W., builders.

(Battersea).—New wharf, with offices, in Vicarage Road for J. Rank, Ltd., flour millers, Baltic House, Leadenhall Street, E.C.

(Lewisham).—Forty-seven houses. Norfolk & Prior, Catford, architects.

(Hammersmith).—In our entry of last week under this head the address of Mr. F. H. Jones was wrongly stated as Coleman Street, E.C., instead of 178, Hammersmith Road, which is the correct address. Unfortunately there is a Mr. F. H. Jones at the incorrect address given, and he has as a result been deluged with letters from electrical firms regarding a matter with which he has no connection. We regret the annoyance thus caused.

(Putney).—Eight shops. Lee & Pain-Clark, 12, South Square, Gray's Inn, W.C., architects.

(Wandsworth).—34 houses. Holloway Bros., 19, Belvedere Road, S.E., builders.

(Stratford, E.).—Addition to Three Mills Distillery. Crickmay and Sons, 13, Victoria Street, S.W., architects.

(Stratford, E.).—Additions to W. H. Hornett's bone-boiling works. S. Jackson, 65, Fenchurch Street, E.C., architect.

(West Ham).—Additions and alterations to St. Thomas's Church. Gale, Durlacher & Emmett, 33, New Bridge Street, E.C., architects.

(Canning Town, E.).—Additions and alterations to provided school in Clarkson Street. Newman & Jacques, 2, Fen Court, Fenchurch Street, E.C., architects.

(Silvertown, E.).—Coal store for H. Tate & Sons, sugar-refining factory.

(Barnsbury, N.).—Rebuilding premises in Pulteney Street, &c. Geo. Carter, 518, Holloway Road, N., architect.

(E.).—Additions and alterations to factory in Brick Lane (£2,665). Fuller, Horsey, Sons & Cassell, 11, Billiter Square, E.C., surveyors; Hawkey & Oldman, 21, Cambridge Road, E., builders.

(Custom House, E.).—Additions and alterations to workshops of Gregson & Co., shipjoiners, Felstead Road.

(Forest Gate).—Extension of St. Peter's Church. W. J. Maddison, 127, Minories, E., builder.

(Stratford, E.).—Additions and alterations to St. Aidan's Church. Banister, Fletcher & Sons, 29, New Bridge Street, E.C., architects.

(Blackfriars).—Power station in Holland Street for London Hydraulic Power Co.

(Brixton).—Factory at rear of 2 and 4, Cranmer Road for Spiers and Pond.

MIDDLETON (Lancs.).—Extensions to Co-operative Wholesale Society's jam and pickle factory.

NEWCASTLE-ON-TYNE.—Large warehouse in Stowell Road for the Newcastle Co-operative Society.

NEWLYN (Cornwall).—Hall and class rooms in connection with St. Peter's Church. H. White, architect, Keigwidn Heamoor, Cornwall.

NEWRY.—Showrooms and warehouses for Rea & Ross, Hill Street, Newry. W. S. Barber, architect, Dundalk and Newry.

NORTHWICH (Plumley).—Extensive new chemical works to be erected on Holford Hall Estate. Ammonia Soda Co., owners.

NOTTINGHAM.—Block of offices and shops (Bridlesmith Gate). H. Holbrook builder, Lenton, Nottingham.

OLDHAM.—Machinery works extensions. For Messrs. Asa, Lees & Co textile machinists.

PARTICK (N.B.).—Offices and stores for Fulton & M'Connell, in South Street.

POOLE.—Blocks of terrace houses. Smart & Wyeth, builders, Poole.

PORTSMOUTH.—Concert pavilion, bars, tea-rooms, and other buildings at South Parade Pier. G. E. Smith, architect, 145, Victoria Road North, Southsea, Portsmouth.

RICHMOND.—Block of shops and offices. Jos. Sawyer, 118, Holborn, E.C., architect. J. Carmichael, Wandsworth, builder.

RIPON.—New secondary school for girls. Connon & Chorley, architects, Leeds.

ROTHERHAM (Swinton).—New Council's schools (£4,791). G. H. Smith, builder, Bank Street, Mexborough.

RYDE (Sea View).—New vicarage (£1,886). E. J. Caws, architect, "Coronation," Sea View, St. Helens (I.W.); C. Langdon, builder, 44, Player Street, Ryde (I.W.).

SADDLEWORTH (Yorks.).—Altering and restarting works. Write, New Walk Mills Printing and Bleaching Co.

SALFORD.—Bakehouse at the workhouse, Eccles New Road. H. Lord, architect, 42, Deansgate, Manchester.

SHEFFIELD.—Residence at the Training College for the T.C. (£10.000).

SHELFORD (near Walsall).—New Council School (accommodate 220) for the Staffs. Education Committee. G. Balfour, Director of Education, County Education Offices, Stafford.

SHORT HEATH (near Wolverhampton).—New Council school (accommodate 276) for the Staffs. Education Committee. G. Balfour, Stafford.

SIDCUP (Kent).—Rebuilding "The Hollies" for Greenwich B.G. W. Mills and Son, builders, Westcombe Park, Blackheath, S.E.

SMETHWICK.—Important extensions to Cornwall Works. Tangyes, Ltd., owners.

SOUTHEND-ON-SEA.—Extensive additions to the pier, including extension of the electric tramway, new kiosks, refreshment rooms, offices and station buildings, for the T.C. (£73,000).

SPRINGWELL (near Newcastle).—Workmen's Club and manager's house. Liddle & Brown, architects, Prudential Buildings, Mosley Street, Newcastle.

STOCKPORT (Hyde).—New secondary day school. Geo. H. Willoughby, architect, 3, York Street, Manchester.

STOURBRIDGE (Lower Hagley).—New Church (£2,900). T. Grazebrook, architect, Stourbridge; Oakley & Coulson, builders, Dudley.

UXBRIDGE (Illingdon).—Ward and administrative blocks, laundry, and disinfector block at the hospital (£5,693). H. D. Bowyer, builder, Mackenzie Street, Slough.

WHITWORTH (Lancs.).—Alteration and re-starting of Bridge Mills, by Councillor J. H. Heys.

WIGAN (Orrell).—Alterations and extensions at Sandbrook Mill, Orrell.

WOLVERHAMPTON.—New Welsh Church in Birch Street (£1,900). Rev. J. E. Jones, pastor.

NOTES.

The Electro-Harmonic Society.—The first smoking concert of the season is to take place on Friday evening next, October 4th. Vocal music will be rendered by Mr. Henry Turnpenny, Mr. Harry Dearth and the Æolian Quartette. There are to be banjo solos by Mr. Arthur Sullivan, humorous stories by Mr. C. W. Wreford, humorous imitations by Mr. Lewes Benet, and humorous sketches by Mr. Oldbury Brough.

We learn from Mr. W. E. Lane, the hon. secretary, that arrangements have been made to hold the Society's concerts during the coming season as follows:—

In the King's Hall, Holborn Restaurant.

Smoking Concert	...	On Friday, October 4th, 1907.
Ladies' Night...	...	On Friday, November 8th, 1907.
Smoking Concert	...	On Friday, December 13th, 1907.
Smoking Concert	...	On Friday, January 10th, 1908.

In St. James' Hall, Great Portland Street, W.

Ladies' Night...	...	On Friday, February 21st, 1908.
Smoking Concert	...	On Friday, March 27th, 1908.

As the King's Hall is becoming inadequate to accommodate the increasing membership of the Society, the Committee have decided to hold the last two concerts of the season in the new St. James's Hall now building in Great Portland Street, where the accommodation is ample. Should the experiment prove successful, it is possible that the Society's concerts may in future be held regularly at this hall; but the heavy extra expense involved would necessitate a further substantial increase in the membership.

Copper.—Messrs. Merton's report for September shows a falling off in visible supplies, 12,742 tons being the figure for mid-month, as against 14,220 for the end of August. Taken in conjunction with the continued fall in the price, this can only mean that consumers are carrying sufficient stock for present needs, and have no immediate cause to induce even the ordinary rate of shipment. The falling off in supply is noticeable in the case of Spain and North America, Australia seemingly finding it worth while to keep shipping.

The financial journals are fairly unanimous in ascribing the depression to over-stocking on the part of the producer, and the falling-off in demand due to absence of work involving the raw material, such as electrical schemes of any magnitude. The *Financial Times*, in taking this view, discusses the question, now beginning to be raised, of closing down certain mines, and so limiting the production. Such a proceeding would have considerable effect on the market, apart from any actual limitation which would eventually result. The same journal gives a table showing that copper has retrograded below the lowest price of 1905, though still above the highest for 1902.

The *Times* New York correspondent says that on September 18th the subsidiary companies embracing and controlled by the Amalgamated Copper Co. voted a material reduction in the production of their Butte mines. This action means probably the lessening of production by two-thirds.

To Our Readers.—If some of our readers should find difficulty in obtaining at certain railway stations copies of the ELECTRICAL REVIEW, we would again suggest their immediately ordering direct from us, or through agents near the said railway stations, but not directly connected with the bookstalls thereat.

High-Voltage Direct-Current Railways.—In a paper read before the Chicago Section of the A.I.E.E., Mr. W. J. Davis, jun., stated that 1,200-volt direct-driven railway equipments had been sold during the past year for a total of 129 miles of railway, the total rating of the motors being 11,700 (? H.P.). Each of the car equipments includes four 75-H.P. commutating-pole motors.

The roads that are now being equipped may be divided into three classes :—(1) Those which are required to operate on 600-volt direct current at full maximum speed as on the 1,200-volt sections; (2) those which are required to operate on 600-volt direct current, but at approximately half maximum speed; and (3) those which operate only on 1,200 volts.

The first class requires motors wound for 600 volts, but designed to withstand 1,200 volts without danger or flashing or injury to the insulation. The motors are connected in four-parallel when run on 600 volts and in two parallel groups of two motors in series when run on the 1,200-volt sections.

In the second and third classes the motors may be wound for either 600 or 1,200 volts, preference being given to the latter on account of the improvement in the tractive power at the slipping point of the wheels. In order to obtain satisfactory commutation qualities and to prevent tendency to flashing at the commutator at the high voltages encountered, all motors for the 1,200-volt system are provided with series-wound auxiliary poles midway between the magnetising poles, and so proportioned as to neutralise the armature reaction locally under all loads. The additional insulation required causes the motors to weigh from 15 per cent. to 20 per cent. more for a given output than 600-volt motors. This additional weight is not due to the inter-pole construction, as on the basis of equal voltages the inter-pole motor will weigh about the same or a little less than the standard railway motor.

The control system is substantially the same as that used on the 600-volt system, with the exception of some slight changes in the insulation of the primary circuits. The secondary circuits are all energised at 600 volts, as are also the car heaters and lamps, and for this purpose a small motor-generator is furnished for use when run on 1,200 volts, the function being to change the voltage to 600. The capacity of this motor-generator as furnished with quadruple 75-H.P. equipment is 38 amperes, which can provide for the lighting, heating and air-pump circuits for one car, and the secondary control-circuit for a train of six cars.—*Electrical World.*

Iron and Steel Institute.—The annual congress of this Institute was opened at Vienna on Monday morning.

The Labour Disputes.—At the time of writing, the labour disputes in the shipbuilding trades, and between railway employés and the companies, have not been decided. As regards the railway men's dispute, a ballot of the men is being taken, the question before them being whether or not they are agreeable to the declaration of a strike in the event of the companies refusing to recognise the officials of the Amalgamated Society of Railway Servants as the men's representatives. It is generally admitted that Mr. Richard Bell, M.P., secretary of the Amalgamated Society, has not attempted to rush the matter at all or to influence unduly the members of the Society. Accompanying each ballot paper is a letter by Mr. Bell putting concisely the history of the negotiations, or attempts at negotiation, so that the men will know precisely how matters stand. It has been pointed out that since the last great strike on the North-Eastern Railway, the Society has been recognised by that company, and any matters in dispute which cannot be settled locally are referred to headquarters, where they receive full consideration. It cannot, of course, be overlooked that the companies could not agree to grant any concessions to members of the Society which they were not prepared to give to all their employés in the same branches or grades, whether members of the Society or not.

Touching on the question which has been raised as to the non-representative character of the Society, it has been asserted by Mr. Bell that whilst their members form only a small proportion of the total number of railway employés, the Society is strongest in the principal centres, and the effect, therefore, of a strike of their members would be far more serious than might be supposed by taking the relative number of society members as a criterion. The principal demands in what is called the "all grades" programme are :—

"An eight-hour day for drivers, firemen, guards, shunters and signal men; also for motormen, conductors and gatemen on electric railways.

"A ten-hour day for all other classes of railwaymen except platelayers.

"No man to be called out for duty with less than nine hours' rest.

"All overtime to be paid for at a minimum rate of time and a quarter, and time and a half to be paid for all time worked between 12 midnight Saturday and 12 midnight Sunday, Christmas Day and Good Friday being regarded as Sundays.

"An immediate advance of 2s. per week to all grades who do not receive the eight-hour day.

"All grades in London districts to be paid a minimum of 3s. per week above wages in country districts.

"A week's wages to be guaranteed to all men whose conditions of service compel them to devote their whole time to the companies. This to be independent of Sunday duty.

"Abolition of the system of working with only one man in the motor-cab on electric railways."

Whilst these conditions, it is pointed out, are the maximum demands of the men, the companies' minimum concession is that they can do nothing at all.

Between these two extremes it is to be hoped that some compromise may be effected without the necessity of resorting to a strike, the effects of which could not fail to be disastrous to many outside industries which have no voice in the matters in dispute.

The position of affairs in the shipbuilding trades is that the Boilermakers' Society have rejected the provisional agreement adopted at Edinburgh; as a result the Employers' Federation decline to discuss any terms for a permanent settlement, and have again given notice to the Society to dispense with the services of members after October 5th. If this notice remains in force it will mean the locking-out of about 40,000 men. Meanwhile the Boilermakers' Executive propose to take another ballot of the men on the question. The members are to be asked whether they will leave the matter in the hands of their executive, or whether they adhere to their previous decision to reject the Edinburgh agreement. In a circular issued by the Committee it is pointed out that if the men vote against the Edinburgh agreement, the responsibility of bringing about a general lock-out will be theirs.

The Boilermakers' Society is generally regarded as one of the best-conducted trade unions in the country, and it has generally managed to make satisfactory terms for its members without recourse to strikes. It is to be hoped that wise counsels will prevail, and that the members will decline to involve 40,000 men in a lock-out because 20 caulkers object to apprentices doing what they are told to do.

Copper and Electrical Companies.—The considerable decline in the price of copper in the past two or three months has been specially welcomed in Germany, where it is expected to exercise a favourable influence upon the development of the electrical industry. With a world's annual production of 723,000 tons, of which the United States represent 415,000 tons, Mexico 62,000 tons, Spain 50,000 tons, Japan 43,000 tons, Australia 37,000 tons, and Chile 26,000, the outturn of 21,000 tons in Germany is comparatively small in relation to its consumption. The United States stand first as the largest consumers with 300,000 tons, Germany ranks second with 151,000 tons, the United Kingdom third with 108,000 tons, and France fourth with 65,000 tons. A large reduction in the price will consequently be seen to represent a considerable sum to electrical firms, provided that their stocks are light and they have not contracted far ahead. The Berlin Allgemeine Co. alone used 16,700 tons of copper at the Oberspree cable works in the year 1905-6, as contrasted with 14,800 tons in the preceding financial year. If it is assumed that similar progress has been made in 1906-7, the copper consumption must have been about 19,000 tons, and there would have been an enormous saving if the material could have been purchased at t e price prevailing to-day. This has, however, been impossible, but a brief calculation will show the very considerable economy which is now possible from the purchase of copper at the present low price, as compared with six months ago, both for German and British consumers of the metal.

An Indian Hospital Installation.—According to the *Indian Electrical, Mechanical and Textile News*, a large electrical installation is being put into St. George's Hospital at Bombay. The installation includes an electric lift for the new Women's Ward, and the present hydraulic lift at the Male Hospital, which is never used now, as it is too slow and unreliable, is to be converted so as to be driven electrically. The two lifts will be similar in all respects, so that spare parts can be adapted to either. The speed will be 150 ft. per minute, and the control will be by an electric switch from the cage. They will be supplied by Messrs. Waygood. In addition both Male and Female Wards will have dinner lifts operated electrically.

A suitable number of electric cooking utensils and sterilising apparatus will be provided on each floor.

For the lighting of the Hospital, there are in all some 266 8-C.P. lamps, 262 16-C.P., and 262 metallic filament lamps of 22 C.P.

A large number of plugs are to be provided throughout the wards to enable portable lights and fans to be used wherever they are likely to be required. For these 105 portable lamps of different sorts are provided and 172 portable fans, while there are in addition 58 ceiling fans. The fans to be used are to be mounted on pedestals 3½ ft. high.

The main illumination of the ward will be from the brackets along the walls, but in addition there will be two or three central lights with opaque green shades which will be hung from reversible fittings, enabling the lamp and shade to be reversed at night, so that the light will be thrown upwards on to the ceiling and the ward will be lit by a dim reflected light. There will also be specially shaded portable night lights for the nurses' use. The wiring will be carried out in armoured insulated conduit in the wards, and in wood casing in the verandahs. The supply company's service mains will be brought into a special distributing station, which will be erected in the grounds of the Hospital, whence overhead supply mains will be led to each building. The whole of the electrical work has been placed in the hands of Messrs. F. & C. Osler & Co. for the sum of Rs. 61,306, plus Rs. 18,856 for four Waygood electric lifts.

Thefts of Electrical Energy.—Under this title the *Electrical World* describes an ingenious method for stealing electricity which has caused a good deal of trouble to the New York Edison Co. A man named Herman Barth has been selling to consumers a so-called "meter regulator." This is essentially a big horse-shoe magnet, which fits down over the top of the electric meter, one leg coming in front and one at the back of the meter, so that the positive pole of the magnet inside the meter is next to the negative pole of the "regulator's" magnet, and *vice versâ*. The "regulator" is then connected with the service wires, and since its magnet is more powerful than the one inside the meter, it makes the hands turn backward. One of the company's counsel in the case says:—

"These devices have been used chiefly in saloons. They are warranted to reduce the light bill more than half. They are usually put over the meter late Saturday night, and by running a certain number of hours, they reduce the meter marking for the previous six days just about 60 per cent. There is no danger of an inspector getting into the basement of a saloon Sunday morning."

By chance some user of the "regulator" left it on his meter, and it was found by one of the company's inspectors. Barth wanted $200 for the machine.

Railway Electrification in the Sierras.—With regard to the proposal mentioned in our last issue for operating the Sacramento Division of the Southern Pacific by electricity, the *Electrical World* publishes a note to the effect that the unlimited manner in which money is being spent on the construction of what is now known as the Stanislaus Electric Power Co. System in Tuolumne County has led to the belief that the Southern Pacific Railroad officials are preparing to operate their trains by electricity. Some assert that the expenditures on the new power line have already reached over $3,000,000. The work has been carried on regularly on a most expensive scale. Large reservoirs are being constructed and a costly power line is being completed. Steel towers will be used instead of the usual poles. It is estimated that $10,000,000 will be spent on this undertaking alone. Four large systems will be established, and Mr. Harriman has plans for a fifth station in the Sierra to supply power for the trains crossing the mountains. About $6,000,000 is to be expended on this plant, and when all of these plants are completed the Southern Pacific will have an exceptionally strong chain of electric systems throughout California, and can supply an immense amount of power, in addition to operating all of its railroads.

Co-operation and a Split.—The *Financial Times* last week published a leading article advocating "Co-operation in Electricity," and after referring to the great possibilities for good that lie in that direction, our contemporary says:—

"The contrast between the motor industry—which is a thing of yesterday, and possesses powerful representative organisations and a co-operative selling system—and the electrical industry is too striking to be overlooked."

It was unfortunate that on the very same day that the above article appeared, the *Standard* was publishing an article showing how disunited is the motor-car industry, which is held up by some as an example for the electrical industry to follow. "Motor Disunion—Split in the Ranks of Rival Organisations—Heated Controversy"—these are the headings of the article!

Perhaps those who are arguing in favour of electrical co-operation would be well advised if they left the motor industry out of the question. Even if there had been evidence beyond shadow of doubt that the motor industry was benefiting from co-operation, that would be far from proving that such a movement would apply itself successfully to a very different industry.

New York City Railroad Co.—It is reported by Reuter that receivers have been appointed for this company, on the joint application of the creditors and the officials. The company operates nearly all the surface and street railways of Manhattan Island, the Bronx and New York City.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the* Electrical Review *posted as to their movements.

General.—Mr. I. V. Robinson, Wh.Sc., has been appointed London manager for Messrs. Richardsons, Westgarth and Co., Ltd., and will take up his duties at their London office, 5, Queen Anne's Gate, Westminster, at the beginning of October. For the past three years he has been with Messrs. A. R. Brown, McFarlane & Co., Ltd., of Glasgow, who represent Messrs. Richardsons, Westgarth & Co. in Scotland.

Mr. F. J. Rynd has resigned his position as manager of the South Wales office of the Electrical Co., Ltd., in order to join Mr. C. P. Sparkes, of Moorgate Court, Moorgate Street, E.C., as assistant in his consulting business. Mr. Rynd has been with the Electrical Co. for the last four years, joining them in 1903 as outside superintending engineer, and in this capacity he had charge, we understand, of all their installations in this country, the most important of which were a complete 6,000-volt three-phase power installation of 6,000 h.p. for the Sunderland Corporation; the power house installation for the Ipswich Corporation electric light and tramways undertaking; the complete electric power installation of 8,000 h.p. in the Aberdare Valley collieries of the Powell Duffryn Steam Coal Co.; the electric plant and pumps for the sinking of their new Penallta colliery, and a 3,000-h.p. gas engine, and 1,500-h.p. gas engine, as well as sundry motors and pumping plant at their Bargoed, Elliot, and new Tredegar collieries, as well as a considerable amount of other work throughout the South Wales coalfield, where he has been for three years. Six months ago Mr. Rynd was appointed manager of the South Wales business of the Electrical Co. Prior to his engagement with the Electrical Co., he was chief assistant electrical engineer to the Portsmouth Corporation.

Mr. Ernesto Danvers, M.I.E.E., consulting engineer, of Buenos Ayres, returns to the Argentine on Saturday, 28th inst., completely restored in health. Owing to the shortness of his stay in this country, and his continued ill-health, Mr. Danvers was, unfortunately, unable to avail himself of the invitations that he received to visit the works of various firms. Mr. Danvers's friends will be glad to learn that his health is now completely re-established.

Central Station Officials.—Mr. A. C. Bostel, of Manchester, has been appointed junior assistant engineer in the business development department at the Birmingham Corporation Electricity Works.

Mr. Percy Olver has been appointed to succeed Mr. F. W. E. Jones as engineer and manager of the Midland Electric Light and Power Co.'s station at Leamington.

Mr. A. S. Barnard, of Cheltenham, has been appointed borough electrical engineer of Walsall, in succession to Mr. Wylie, who, as already announced, has gone to New Zealand. Mr. Barnard, who is 39 years of age, was lately in the employ of the Government of Ceylon, and adviser to the municipality of Colombo. He relinquished the latter position in May last. It will be remembered that prior to going out to Ceylon, Mr. Barnard was electrical engineer to the Hull Corporation.

Obituary.—Our Glasgow correspondent says that the death is announced of Mr. David Carlaw, engineer, Glasgow, who was associated with Lord Kelvin in the making of instruments connected with the working of the Atlantic cable.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Electric Light, Power and Hiring Co., Ltd. (72,303).—This company's annual return was filed on August 27th, when £13,206 shares had been taken up out of a nominal capital of £15,000 in £1 shares. 8s. per share has been called up and £5,282 8s. has been received. Mortgages and charges: Nil.

Leicestershire and Warwickshire Electric Power Synd., Ltd. (72,274).—Issue on September 5th of £100 6 per cent. debentures, part of series created July 9th, 1907, to secure £5,000, charged on the company's undertaking and property, present and future, including uncalled capital. No trustees. Previously issued of same series: £650.

New General Traction Co., Ltd. (47,321).—This company's annual return was filed on July 4th, when the entire capital of £370,000 in £5 shares (50,000 preference and 24,000 ordinary) had been taken up. £250,000 has been paid on the preference shares, and £120,000 is considered as paid on the ordinary. Mortgages and charges: £280,000.

John M. Kaiser, Ltd. (91,338).—The statutory report, made up to July 20th (filed July 23rd), shows 717 shares allotted; 600 are credited as fully paid, and £110 has been received in cash. The nominal capital is £1,000 in £1 shares. A debenture for £100 was registered on February 16th, 1907.

James & Browne, Ltd. (Engineers and Electricians, Hammersmith) (72,372).—Issue on August 20th of £100, and on August 23rd of £950 5 per cent. debentures, part of series created June 29th, 1906, to secure £6,000, charged on the company's undertaking and property, present and future, including uncalled capital. Trustees: J. E. Ellis, Portland House, Basinghall Street, E.C.; and E. Hughes, 106, Holland Road, Kensington. Previously issued of same series: £4,950.

Anglo-Iberian Electric Light and Power Co., Ltd. (76,053).—This company's annual return, made up to January 14th, was filed on July 15th. 106 shares have been taken up out of a nominal capital of £10,000 in £1 shares. £1 per share has been called up and paid on 100. Nothing has been called up on 6. Mortgages and charges: Nil.

Electrical Oil Refining Co., Ltd. (43,126).—This company's annual return was filed on August 20th, when 4,375 shares had been taken up out of a nominal capital of £5,000 in £1 shares. £882 has been received, and £3,493 is considered as paid. Mortgages and charges: Nil.

Electricity Supply Co. for Spain, Ltd. (29,103).—This company's annual return was filed on July 31st, when 34,660 preference, 19,900 ordinary, and 100 founders' shares had been taken up out of a nominal capital of £205,000 in 40,000 preference shares of £5 each, 19,900 ordinary shares of 5s. each, and 100 founders' shares of 5s. each. 5s. per share has been called up on 19,900 ordinary, resulting in the receipt of £4,975. £173,325 is considered as paid on 34,660 preference, and 100 founders'. Mortgages and charges: £189,500.

F. W. Smith & Co., Ltd. (56,604).—This company's annual return was filed on July 29th, when 600 shares had been taken up out of a nominal capital of £5,000 in £5 shares. £5 per share has been called up, resulting in the receipt of £3,000. No mortgages or charges.

Accessories Manufacturing Co., Ltd. (84,107).—This company's annual return was filed on August 19th, when 2,443 preference and 1,064 ordinary shares had been taken up out of a nominal capital of £10,000 in 5,000 preference and 5,000 ordinary shares of £1 each; £1 per share has been called up on 7 ordinary and £7 has been received; £3,500 is considered as paid on 2,443 preference and 1,057 ordinary. Mortgages and charges: £3,300.

Sunbeam Lamp Co., Ltd. (25,498).—This company's annual return was filed on August 8th, when 1,765 shares had been taken up out of a nominal capital of £25,000 in £10 shares; £9,080 has been received and £8,570 is considered as paid. Mortgages and charges: £8,800.

Ecuador Telephone Co., Ltd. (29,295).—This company's annual return was filed on July 26th, when 5,000 shares had been taken up out of a nominal capital of £100,000 in 20,000 shares of £5 each; £25,000 had been received. Mortgages and charges: Nil.

Bray, Markham & Reiss, Ltd. (74,871).—This company's annual return was filed on August 9th, when 8,000 shares had been taken up and paid for in full, out of a nominal capital of £20,000 in £1 shares. Mortgages and charges: Nil.

Electric and General Investment Co., Ltd. (31,506).—This company's annual return was filed on July 17th, when the entire capital of £200,000 in £5 shares (20,000 ordinary, 100 founders' and 19,900 preference) had been taken up. £1 per share has been called up on 20,000 ordinary, and £5 per share on 100 founders' and 19,900 preference, resulting in the receipt of £120,000. Mortgages and charges: Nil.

Lumb Electrical Bleaching Co., Ltd. (Edenfield) (91,562).—Issue on September 1st of £1,775 6 per cent. second debentures, part of series created January 18th, 1907, to secure £15,000, charged on the company's undertaking and property, present and future, except uncalled capital, subject to first debentures. No trustees. Previously issued of same series: £13,225.

CITY NOTES.

Dick, Kerr & Co., Ltd.

Mr. John Kerr presided on Tuesday over the ordinary general meeting of this company held at Cannon Street Hotel. In moving the adoption of the report (see Electrical Review, September 20th, p. 471), the Chairman said they would note that the net profits for the year under review amounted to £80,476, or a reduction of £5,878 compared with last year. Naturally they would, like the board, regret that there should be any diminution of profits, but on a calm survey of the business situation, and taking the experience of other concerns somewhat similarly engaged in industry, he thought they could rejoice that their position had been so well maintained. It was, perhaps, scarcely necessary for him to impress upon them that the directors, with the approval of the auditors, had as usual taken every care to charge fully against revenue for all contingencies. Apart from the competition to which he referred last year as keen, they had, he was sorry to say, found little or no amelioration during the last 12 months. They were prepared to take part in the struggle, and to endeavour to hold their own, but their directors deprecated the folly of ruinously cutting prices. If they had during the last two years been able to maintain their profits, he trusted they could look forward to a time when all the energy and capital they had might get a more generous return. Apart from the competitive element, which he hoped he had not laboured too much, another element affecting the profits had been the great increase in the cost of raw materials. Electrolytic copper, of which they bought a large amount, had been not only high in price, but very fluctuating. In January last it was £115, in April £122, in June £106, and now in September it is £72 per ton. As manufacturers, they did not object to paying a reasonable price for copper, but it was the severe fluctuations that militated against them and made business most difficult. As they had now at the credit of the reserve accounts £216,000, their directors had, after giving the subject the fullest consideration, decided to recommend that no addition should be made this year to the reserves, but instead, they would increase the carry forward by £23,063, making that amount £79,140, being an amount practically equal to last year's profits. Their directors had always in view the safeguarding of the interests of the debenture-holders and preference shareholders, by keeping the funds well in hand. That conservative action was bound to strengthen in the end the position of the ordinary shareholder. By reason of the stringency in the money market, many schemes for which much material they produced would be required, were in a state of suspended animation. The great shrinkage in the capital values of all classes of securities had naturally caused a check on new enterprises. The enormous wastage of capital involved in the South African war, the Russo-Japanese war, and the destruction of San Francisco, all pointed to a restraint in speculative activity. The Board of Trade returns would give the impression that this country was enjoying a period of boundless prosperity. One or two favoured trades had certainly had a good time, as also some producers of raw material, but a careful study of the true position would, he thought, satisfy most people that the margin of profit had been greatly reduced compared to many years when the Board of Trade figures were of a more modest character. He could not conclude without expressing the directors' thanks to the management and the staff for the whole-hearted manner in which they had, one and all, worked during an arduous 12 months. There was a harmony and an *esprit de corps* which could not fail to make for success.

Mr. Claud T. Cayley seconded the motion, and the report was adopted.

United Electric Car Co., Ltd.

The annual meeting was held at Preston on September 19th. Mr. Geo. Richardson presided, and in moving the adoption of the report (see Electrical Review, Sept. 13th, 1907), he said that the report and balance-sheet were of a most satisfactory character. Twelve months ago they anticipated a better state of things for the company, and that prediction had proved correct. The directors considered the result of the year's trading very satisfactory, for with a greatly reduced production as compared with the previous year they had made a profit of nearly £7,000 more, which clearly showed that they had had no serious drawbacks, and that the works had been engaged on profitable lines all through. The company were consequently in a better position to place to general reserve £2,000, which was not done last year, and the directors had written off the balance of the preliminary expenses in connection with the purchase of the new works, amounting to £2,000 and had also carried forward to next year £5,095, which was nearly £3,000 more than in 1906. The depreciation reserve on buildings, fixed plant and machinery, with £4,550 brought in, amounted to £25,500, which the directors thought ample and highly satisfactory, considering that the works and plant had been maintained in perfect condition and working order out of revenue. Another feature on which the directors might congratulate themselves was the bank balance. Twelve months ago the company owed the bank £9,374, but now they had a credit balance of £6,506. The present slackness was unfortunate and quite unforeseen, but so long as they knew orders were not going elsewhere which should come to them, the directors could only hope for an early revival.

The report was adopted, and it was decided to pay the preference dividend for the half-year ending June 30th, and a dividend of 5 per cent. on the ordinary shares, less income-tax.

Halifax and Bermudas Cable Co., Ltd.

The directors' report, to which we referred briefly last week, says that the net result of the year's working (June 30th, 1907) is a profit of £3,182, as compared with £3,274 for the previous year. An interim dividend of 2½ per cent., free of income-tax, has already been paid, and it is now proposed to make a further equal payment, free of income-tax, which will leave £682 to be carried forward. For the first time after 16 years of uninterrupted working, the company's cable developed a fault which last October had to be cut out at the cost of £2,094. The business of the year was further adversely affected by the earthquake at Jamaica, which severed the Direct West India Co.'s cable, and which was unable to supply through messages from January 14th to February 23rd, and later, by the interruption of the Bermuda-Turks Island section, from March 14th to April 7th. The balance to credit of revenue account, which was last year increased to £18,010 2s. 3d., has been debited with the £2,094 10s. expended in repairs during the year and credited with £682 8s. 8d. surplus revenue of the past year, and it now stands at £16,598 0s. 11d. During the year debentures have been paid off to the amount of £9,000, leaving £28,900 outstanding.

Dundee, Broughty Ferry and District Tramways Co., Ltd.

The second annual meeting was held on Monday. The accounts were considered satisfactory and approved, and the necessary dividends ordered to be paid over to the Limited Company. On account of the damage done the directors decided to withdraw all permits for traffic by carts, motor cars, &c., on the new road, the maintenance of which lies on the company.

Anglo-Argentine Tramways Co., Ltd.—The directors have declared an interim dividend to June 30th last, of 4s. per share on the ordinary shares, Nos. 260,008 to 580,007 inclusive, which under the recent special resolutions become second preference shares, being at the rate of 8 per cent. per annum, free of income tax, payable on and after October 7th next. The transfer registers will be closed from September 25th to October 7th, both dates inclusive.

Stock Exchange Notice.—The Committee has ordered the undermentioned securities to be quoted in the Official List:—

Kalgoorlie Electric Power and Lighting Corporation.—100,000 ordinary shares of 10s. each, fully paid, Nos. 175,001 to 275,000; and 150,000 6 per cent. preference shares of £1 each, fully paid, Nos. 1 to 150,000, in lieu of the preferred shares of the Kalgoorlie Electric Power and Lighting Corporation now quoted.

Canadian General Electric Issue.—The *Times* understands that the issue of preference shares by this company has been postponed, owing to the discovery that the provisions made to ensure priority in capital rights are not regarded as quite satisfactory. A fresh by-law will consequently have to be passed by the company, and a delay of about a fortnight is expected in the appearance of the issue.

American Telephone and Telegraph Co.—A quarterly dividend of 2 per cent. is declared.

Eastern Telegraph Co., Ltd.—The directors announce a dividend at the rate of 3½ per cent. per annum, less income-tax, on the preference stock, for the quarter ending September 30th, and a second quarterly interim dividend of 1½ per cent. on the ordinary stock, free of income-tax.

Melbourne Tramway and Omnibus Co.—A dividend at the rate of 15 per cent. per annum has been declared for the three months ended September 30th.

France.—La Société des Tréfileries du Havre (anciens Etablissements Lazare Weiller) reports a profit of £88,000 for the last financial year. A dividend of 9 fr. per share is being declared, as compared with 8 fr. in the preceding 12 months.

Direct Spanish Telegraph Co., Ltd.—The board has decided to pay, in addition to the dividend at the rate of 10 per cent. per annum on the preference shares, an interim dividend at the rate of 4 per cent. per annum, free of income-tax, on the ordinary shares, both for the half-year ended June 30th, 1907, and payable on October 1st next.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Fortnight ended.	Receipts for the fortnight. £	£*	No. of wks.	Total to date. £	£*	Route miles open.	Inc.
Aberdeen	Sept. 18	3,177	— 44	16	25,014	— 346	14·4	..
Ayr	,, 21	1,096	— 80	19	7,834	— 242	8	..
Bath	,, 21	1,058	— 66	38	30,712	— 1,285	13	..
Belfast	,, 20	7,645	+ 571	25	92,324	+ 4,886	40	..
Birkenhead	,, 22	2,199	+ 89	25	26,893	— 406	13·52	..
†Birmingham Corp.	,, 14	6,272	..	24	145,208	..	56·5	..
Blackburn	,, 18	2,619	+ 460	25	29,028	+ 1,613	14·13	..
Blackpool Corp. ..	,, 19	4,746	+ 746	..	38,871	— 1,912	11·87	..
,, —Fleetw'd.	,, 21	2,774	+ 176	11	17,989	— 1,198	8·25	..
Bolton	,, 22	4,684	+ 516	25	58,465	+ 8,370	26	..
Bournemouth ..	,, 18	4,502	+ 304	24⅞	47,200	+ 862	21·5	2⅞
Bradford	,, 21	9,741	+ 737	25	119.105	+ 1,071	53	..
Brighton	,, 22	2,262	+ 70	25	25,451	— 2,681	9·5	..
Bristol	,, 20	11,095	— 349	..	..	..	28·5	..
Brit. Elec. Trac. Co.								
Airdrie	,, 13	477	— 19	36	8,070	— 54	3·65	..
Barnsley	,, 13	346	+ 12	,,	6,105	+ 69	..	..
Barrow	,, 13	631	— 3	,,	9,590	— 166	5·37	..
Cavehill	,, 13	211	— 57	,,	3,187	— 110	..	..
Devonport	,, 13	1,092	— 25	,,	16,848	— 140	8·85	..
Gateshead	,, 13	2,068	+ 24	,,	36,555	+ 874	11·25	..
Gravesend	,, 13	584	— 13	,,	9,022	— 84	6·5	..
Greenock	,, 13	1,420	— 242	,,	24,297	— 775	7·25	..
Hartlepool	,, 13	699	— 41	,,	10,715	— 657	6·72	..
Kidderminster ..	,, 13	288	— 8	,,	4,500	— 195	..	..
Leamington	,, 13	383	+ 14	,,	5,906	— 752	3	..
Merthyr	,, 13	446	+ 13	,,	7,636	+ 384	2·9	..
Metropolitan ..	,, 13	11,335	+3,039	,,	168,668	+41,108	22	..
Middleton	,, 13	815	+ 16	,,	13,064	— 200	8·5	..
Mid. Joint Com'tee	,, 13	12,226	+ 307	,,	200,892	+ 2,166	..	..
Oldham — Ashton	,, 13	713	+ 111	,,	22,088	+ 990	9·13	..
Peterborough ..	,, 13	286	— 29	,,	4,660	— 269	5·51	..
Potteries	,, 13	8,839	+ 155	,,	67,900	+ 1,959	29	..
Rothesay	,, 13	774	+ 125	,,	9,119	— 556	2·75	..
Southport	,, 13	819	+ 61	,,	11,885	— 628	8·17	..
S. Metropolitan ..	,, 13	1,974	+ 872	,,	29,916	..	..	..
Swansea	,, 13	2,109	+ 204	,,	33,429	+ 2,117	5·5	..
Tynemouth	,, 13	665	— 74	,,	9,419	— 817	3·75	..
Weston-s-Mare ..	,, 11	605	— 1	,,	5,896	— 569	3	..
‡Worcester	,, 13	710	— 8	,,	10,436	— 277	5·75	..
Wrexham	,, 13	252	— 2	,,	3,767	— 68	..	..
Yorks. Wool. Dist.	,, 13	1,694	— 271	,,	34,519	+ 1,048	17	..
Miscellaneous ..	,, 13	651	— 15	,,	8,296	— 184	..	..
Burnley	,, 21	2,768	+ 331	..	..	..	7·5	..
Burton-on-Trent ..	,, 22	560	— 14	25	7,506	— 378	11	1·5
Bury	,, 15	2,523	..	24	27,317	..	10·5	..
†Cardiff	,, 14	2 324	+ 156	24	54,026	+ 1,795	15·87	..
Carlisle	,, 21	385	+ 6	38	6,640	— 525	..	..
Chatham and Dist.	,, 19	1,657	— 112	38	27,616	+ 1,716	12·16	·68
†Cork	,, 19	546	+ 28	38	17,830	— 743	9·89	..
Croydon	,, 20	3.115	+ 128	25	36,857	— 1.892	12	·75
Darlington	,, 21	209	— 3	25	5,395	— 64	..	..
Darwen	,, 20	584	+ 37	25	6,507	— 16	4·36	..
Dover	,, 21	541	— 27	25	6,348	— 921	4·75	..
Dublin	,, 20	14,607	+4,122	..	89,367	+20,538	54·25	5·5
Dundee	,, 18	2,412	+ 131	18	20.977	+ 489	13	·5
East Ham	,, 21	1,996	+ 181	25	28,469	— 345	7·75	..
Exeter	,, 20	753	+ 110	25	8,624	+ 709	4·75	·5
Glasgow	,, 21	37,559	+1,937	16	282,999	+ 5,019	89·75	8
Hastings	,, 19	3,175	..	..	..	..	..	..
Huddersfield ..	,, 21	3,980	+ 262	25	40,578	+ 2,037	28	..
Hull	,, 21	2,768	+ 245	25	30,181	+ 3,061	13	..
Ilkeston	,, 18	314	+ 22	25	3,686	+ 184	3·5	..
Ipswich	,, 21	965	+ 10	25	11,096	— 891	10·5	..
Isle of Thanet ..	,, 21	2,370	+ 241	38	27,201	— 697	11	..
Kilmarnock ..	,, 21	315	— 17	18	3,055	— 77	4·25	..
Lan'kshire Trm. Co.	,, 19	2 883	+ 943	38	44,663	+11,281	15·82	3·26
Lancashire United	,, 18	2,987	+ 917	38	48.187	+12,265	38·5	9
Leeds	,, 14	7,011	+ 516	24	159,828	+ 6,212	51·12	6·5
Leicester	,, 21	4.475	+ 144	..	..	..	..	..
Leith	,, 14	1,085	— 40	17½	2,759	— 24	6	..
Liverpool	,, 14	22,538	+ 48	37	404.307	+ 6,972	104	..
††L.C.C.	,, 14	64,225	+11,588	24	753,773	+120,058	116⅛	19·37
London United ..	,, 20	15,771	+2,459	37½	250,672	+ 9,856	..	..
Lowestoft	,, 21	664	+ 49	51	10,606	+ 979	3·5	..
Manchester	,, 21	31.344	+3,035	25	375,072	+28,081	86	7·5
Newcastle	,, 21	8,087	— 17	25	109,186	+ 351	..	..
Newport	,, 21	1,399	+ 33	25	18,110	+ 1,611	14·5	..
Northampton ..	,, 20	903	+ 17	24⅝	11,279	— 523	6·5	..
Oldham	,, 22	4,049	+ 894	26	51,174	+ 3,218	23·75	..
Pontypridd	,, 21	566	+ 239	25	6,699	+ 2.288	5	1·25
Portsmouth ..	,, 21	2,279	+ 278	25	54,806	— 2,208	14·5	..
Preston	,, 18	1,583	+ 66	..	..	..	..	..
†Reading	,, 19	1,317	— 22	24½	15,805	— 697	12·95	..
Rotherham	,, 19	1,292	+ 242	24½	15,067	+ 2,374	10	·66
Salford	,, 16	4,814	+ 408	24	114,323	+ 2,229	33·9	..
Sheffield	,, 22	11,323	+ 791	26	145,111	+ 6,368	35·75	..
Southampton ..	,, 18	2.315	+ 185	24	26,332	+ 824	..	..
Southend-on-Sea ..	,, 18	1,174	+ 102	25	11,832	— 293	..	..
Sunderland	,, 22	2,886	+ 122	24	36,717	— 424	..	..
Swindon	,, 18	376	+ 8	..	..	..	4·4	..
Tyneside	,, 18	1,005	+ 109	38	17.731	+ 746	3·87	..
Wallasey	,, 21	1,846	+ 175	25	22,357	+ 514	3·72	·22
†Walthamstow ..	,, 14	735	+ 68	24	15,842	— 138	9	..
West Ham	,, 19	4,757	+ 241	25	59,508	+ 1,341	16·7	..
Wolverhampton ..	,, 18	1,677	+ 32	24	21,568	+ 281	12·5	..
Yorks. W. Riding ..	,, 22	2,485	+ 327	38	44,180	..	..	..
Baker St.-Waterloo	,, 21	4,860	+1,300	12	27,135	+10,895	4·25	1
Cen. London Rly.	,, 21	9,302	—2,580	12	57,579	— 8,308	6	..
Char. +, Eus. Hamp.	,, 21	4,940	..	12	30,005	..	7·75	..
City & S. Lon. Rly.	,, 22	5,909	+ 220	12	36,290	+ 5,607	7·3	1·05
Dublin-Lucan Rly.	,, 20	317	+ 37	12	1,892	+ 146	7	..
G.N. and City Rly.	,, 21	3,193	— 177	12	18,988	— 97	3·5	..
G.N., P'dy. & Brmp.	,, 21	7,675	..	12	46,325	..	9	..
L'pool Overh'd Rly.	,, 22	4,011	+ 105	12	19,913	+ 1,181	6·8	4·3
Mersey Railway ..	,, 21	3,529	+ 191	12	21,686	+ 1,609	4·5	..
Metropolitan Rly.	,, 22	29,460	+ 412	12	175,888	+ 4,843	24·5	..
Met. District Rly.	,, 22	14,328	— 878	12	86,814	— 416	24	..
Anglo-Argentine ..	,, 23	33,111	+2,167	38	625,449	+61,008	43	..
§Auckland	Aug. 16	10,068	+ 505	32⅝	83,769	+ 3,473	19·2	·56
§Brisbane	August	15,225	+1,089	..	..	..	..	..
§Brit. Columbia Rly.	,,	31,400	+8,300	9	62,600	+18,250	..	..
Calcutta	Sept. 21	6,498	+ 15	..	..	..	..	..
§Cape Electric T. Ld.	August	9,240	..	..	..	..	..	..
§Geneva	,,	9,579	+ 627	..	..	..	..	..
§Kalgoorlie, W.A. ..	,,	4,549	..	35	31,955	..	20·5	..
Madras	Sept. 15	1,215	+ 231	36	19,521	+ 3,324	12·75	2·25
§Lisbon	May	896	..	..	..	..	..	..
Perth (W.A.) ..	Sept. 20	2,551	— 111	38	53,399	— 1,863	15·48	·92

* Compared with the corresponding period of 1906. † One week only.
‡ Includes horse, steam and other receipts. § One month.

STOCKS AND SHARES.

Tuesday Afternoon.

Stock Exchange markets continue to be dominated to some extent by the now less threatening crisis in the railway world. The speeches at last Sunday's Cardiff meeting caused a sudden revulsion of the previous nervousness, and a sharp rally in Home Railway stocks as a whole. But electrical issues are mostly weak. There is, however, a better tone amongst electricity shares, and the telegraph list maintains its firmness with some consistency.

Quite a good reason for much of the Stock Exchange depression within the last decade is furnished by the *Financial Times* in a recent article showing that no less than £726,000,000 sterling has been raised by Governments and public bodies during the last 12 years. It is scarcely surprising that the public appetite for investment should be a trifle fastidious after such a Gargantuan repast.

Central London stocks are again very flat, the Ordinary and Deferred especially so. The Preferred is down a point to 89, but the two other issues have fallen 4 each. City and South London Ordinary stays at 46. Great Northern and City Preferred are back at 30s., losing their last week's rise. Districts picked up a little at 11½, and Metropolitan Consolidated at 39 is slightly down. Sir Charles McLaren, chairman of the Metropolitan Railway, has spoken strongly in favour of railway directors affording recognition to the representatives of the men, however those representatives be chosen.

Electricity supply issues show improvements in Charing Cross, Chelsea, County of London and Metropolitan descriptions, the rises ranging from Ordinary shares to Debenture stocks. Oxfords are still rather pressed for sale, and a further fall of ⅛ has occurred.

Chatting to a well-known dealer in electricity shares the other day, we asked what immediate hope there was for his market. The reply was not encouraging. If it be not one Bill that is brought forward next year, he argued, it will be another, each bearing no goodwill towards the companies. While such a state of suspense lasted, he went on, the market would be pretty sure to remain parlous. On the other hand, there is the chance of the Stock Exchange becoming busy with investment orders, in which case the good yields to be obtained from electric lighting shares might attract fresh attention from the public.

Copper, the metal, is now playing so important a part in the speculative markets that its movements are closely followed by a host of amateurs, who study the pronouncements of the recognised authorities with avidity. One of these experts observed in a circular at the end of last week that the demand for copper was waning, partly in consequence of the "electrical boom" having subsided to some degree. May be not all electrical manufacturing firms will agree that the word "boom" is well-chosen.

Cromptons at 1⅞ are a trifle easier, but India-Rubber, Gutta-Percha shares have recovered from their weakness.

Traction varieties are singularly quiet. British Electrics have not moved. Potteries Ordinary are lower at 7s. 6d. middle. Anglo-Argentine Ordinary lost some of their earlier advance, while Belgrano Ordinary at 4 9/16 were 1/16 better. Calcutta trams still exhibit weakness, at 7½ showing a decline of the fraction.

Attention was recently directed to the hints in circulation with references to important Marconi developments said to be at hand. The scepticism then expressed has so far been put to the blush of shame by 2s. 6d. rise in the shares, the price now being 20s. 6d. What the developments are, the market still appears to be in doubt.

Eastern Telegraph Ordinary stock has risen a point, and Western shares are ⅛ better. The Anglo-American group fell, upon fairly extensive realisations by a speculating division. Anglo "A" is down 1½. Globe shares are still dull, despite the usual dividend declarations, and the Mackay Companies' stocks are both a couple of points lower on sales emanating from Wall Street. National Telephone Deferred stock is better, but the First Preference shares at 11½ are ½ down.

Canadian General Electric shares have risen to 116, and there is a fair amount of business doing in them. We believe that the coming issue of Preferred shares has been postponed for a week or two pending the alteration of some technical point in the prospectus that is to be published.

Bromley (Kent) Electric Light and Power Co., Ltd.—An interim dividend of 2 per cent. for the half-year ended June 30th is announced.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share. *	Dividends for the last four years. 1903.	1904.	1905.	1906.	Closing Quotations Sept. 17th.	Closing Quotations Sept. 24th.	Business done week ended Sept. 24th, 1907. Highest	Lowest.	Rise + or Fall —	Present Yield per cent £ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	..	3 — 3½	3 — 3½	..	..	..	Nil
149,600	Do. do. 5 % Debs., Nos. 1 to 1,250 Red.	100	Nil	Nil	5 %	5 %	85 — 88	85 — 88	..	..	..	5 13 8
660,660	Anglo-American Telegraph	Stock	61s.	22½	32½	37½	60 — 63	59 — 62	..	..	−1	6 5 5
3,169,670	Do. do. do. 6 % Pref.	Stock	6 %	5½%	6 %	6 %	104⅜—105⅜	103 —104	105½	103½	−1½	5 15 5
3,169,670	Do. do. do. Deferred	Stock	2s.	Nil	½%	13⅜	17⅞— 18½	16½— 16⅝	18	16⅜	−1½	10 8 11
50,000	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	..	..	5 %	5 %	99 —102 xd	99 —102	..	..	..	4 18 0
44,000	Chili Telephone, Nos. 1 to 44,000	5	7 %	8 %	8 %	8 %	6⅞— 7⅛	6⅞— 7⅛	..	..	..	5 10 4
2,097,689	Commercial Cable Stlng. 500 year 4 % Deb. Sk. Red.	Stock	4 %	4 %	4 %	4 %	91½— 93½	91½— 93½	92	91½	..	4 5 7
16,000	Cuba Telegraph	10	0 %	5 %	5 %	5 %	6½— 7⅛	6½— 7⅛	..	..	..	6 13 4
6,000	Do. 10 % Pref.	10	15 %	10 %	10 %	10 %	15½— 16⅝	15½— 16⅝	..	..	..	5 19 5
12,931	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	4 %	3⅜— 3⅝	3⅜— 3⅝	..	..	..	5 8 6
6,000	Do. do. 10 % Cum. Pref. ..	5	10 %	10 %	10 %	10 %	9 — 9½	9 — 9½	..	..	..	5 5 3
80,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	98 —101	98 —101	..	..	..	8 18 2
60,710‡	Direct United States Cable	20	3 %	3½%	4½%	4⅝%	14⅜— 14⅞	14⅜— 14⅞	14⅞	14⅜	..	5 17 3
57,000	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,200, R.	100	4½%	4½%	4½%	4½%	100 —102	100 —102	100½	..	..	4 8 3
4,000,000	Eastern Telegraph, Ord. Stock..	Stock	7 %	7 %	7 %	7 %	132 —137	133 —138	135	132½	+1	5 1 5
2,000,000	Do. 3½ % Pref. Stock..	100	3½%	3½%	3½%	3½%	86 — 88	86 — 88	..	..	..	3 19 7
1,896,706	Do. 4 % Mort. Deb. Stock. Red. ..	Stock	4 %	4 %	4 %	4 %	103 —105	103 —105	..	..	..	3 19 1
300,000	Eastern Extension, Australasia, and China Tele.	10	7 %	7 %	7 %	7 %	12⅜— 13½	12⅜— 13½	13½	12½	..	5 5 8
752,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	102½—104½	102½—104½	..	..	..	3 16 7
295,400	East & S. Afric. Tel., 4 % Mt. Db., 1 to 3,000, red. 1909	100	4 %	4 %	4 %	4 %	97⅞—100½	97⅞—100½	..	..	..	3 19 7
200,000‡	Do. 4 % Reg. M. Debs. (Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
181,127	Globe Telegraph and Trust	10	5½%	5⅝%	5½%	5½%	10½— 10⅝	10½— 10⅝	10⅝	10½	..	5 2 4
181,127	Do. do. 6 % Pref.	10	6 %	6 %	6 %	6 %	13½— 13⅝	13½— 13⅝	..	..	..	4 7 3
150,000	Great Northern Telegraph, of Copenhagen	10	15 %	24 %	24%	20 %	34 — 36	34 — 36	34½	..	..	5 11 1
28,900	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,200, Red.	100	4½%	4½%	4½%	4½%	100 —102	100 —102	..	..	..	4 8 3
17,000	Indo-European Telegraph	25	10 %	13 %	13 %	13 %	55 — 57	55 — 57	56¼	55½	..	5 14 0
$41,380,400	Mackay Companies Common	$100	..	1 %	2 %	3½%	66 — 69xd	64 — 67	..	..	−2	5 4 6
$50,000,000	Do. do. 4% Cum. Pref.	$100	..	4 %	4 %	4 %	66 — 69xd	64 — 67	..	..	−2	5 19 5
256,127	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	..	1 — 1	1 — 1	21/3	18/1½	+ ⅛	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	3 %	4 %	5 %	..	1 — 1	1 — 1	..	..	..	4 14 1
86,492	Do. do. 5 % Pref. ..	1	5 %	5 %	5 %	..	1 — 1	1 — 1	..	..	..	5 0 0
2,225,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	106 —108	106 —108	107⅞	106⅜	..	5 11 1
2,225,000	Do. do. Def. Stock	100	5 %	5 %	5 %	5 %	105¼—107⅛	106 —108	107½	106½	+ ⅛	4 12 7
15,000	Do. do. 6 % Cum. 1st. Pref.	10	6 %	6 %	6 %	6 %	11 — 13	10½— 12½	11⅞	..	— ⅛	4 16 0
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	6 %	6 %	5 %	10 — 12	10 — 12	11⅛	11⅛	..	4 3 4
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5½— 5¾	5½— 5¾	..	..	..	4 10 11
2,000,000	Do. do. 3½ % Deb. Stock Red. ..	Stock	3½%	3½%	3½%	3½%	96 — 98	96 — 98	96½	96	..	3 1 3
1,689,593	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	101 —103	101 —103	101¼	..	..	3 18 1
179,313	Oriental Telep. and Elec. 1 to 171,504, fully paid ..	1	6½%	6½%	7 %	7 %	1⅛— 1⅜	1⅛— 1⅜	26/3	..	..	5 1 10
50,000	Do. do. do. 6 % Cum. Pref... ..	1	6 %	6 %	6 %	6 %	1⅝— 1.5/16	1⅝— 1.5/16	..	..	..	4 11 5
100,000	Do. do. do. 4 % Red. Deb. Stock ..	100	..	..	4 %	4 %	91 — 94	91 — 94	..	..	..	4 5 1
100,000	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	10	4 %	4 %	4 %	4 %	97 —100	97 —100	..	..	..	4 0 0
11,839‡	Reuter's	8	5 %	5 %	5 %	5 %	7 — 8	7 — 8	7 7/16	..	..	5 0 0
60,000	Telephone Co. of Egypt, 4½ % Deb. Red.	100	..	..	4½%	4½%	98 —101	98 —101	..	..	..	4 9 1
3,167	Submarine Cables Trust	Cert.	6 %	6 %	6 %	6 %	127 —130	127 —130	..	..	..	4 13 4
80,000	United River Plate Telephone	5	8 %	8 %	8 %	8 %	6¾— 7⅛ xd	6¾— 7⅛	7⅛	..	..	5 10 4
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	5 — 5¼	5 — 5¼	..	..	..	4 10 11
15,603‡	West African Telegraph, Shares	10	4 %	4½%	4 %	4 %	10 — 10¼	10 — 10¼	..	..	..	3 16 2
30,008	W. Coast of America, 1 to 30,000 & 53,001 to 53,008	2	Nil	Nil	Nil	24%	1⅛ — 1⅜	1⅛ — 1⅜	..	..	..	3 12 9
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	4 %	97 —100	97 —100	..	..	..	4 0 0
207,930	Western Telegraph, Ltd., Nos. 1 to 207,930.. ..	10	7 %	7 %	7 %	..	13 — 13¼	13 — 13¼	13⅜	19⅛	+ ⅛	5 3 8
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	100 —103	100 —103	..	..	..	3 17 8
88,321	West India and Panama Telegraph	10	Nil	Nil	Nil	Nil	7/16— 9/16	7/16— 9/16	8/9	..	..	Nil
34,563	Do. do. 6 % Cum. 1st Pref.	10	7 %	6 %	5 %	8 %	7⅛— 7⅜	7⅛— 7⅜	7 7/16	..	..	10 5 9
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	Nil	Nil	Nil	6¾— 7⅛	6¾— 7⅛	..	..	..	Nil
80,000‡	Do. do. 5 % Debs., Nos. 1 to 1,800	100	5 %	5 %	5 %	5 %	99 —102	99 —102	..	..	..	4 18 9

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

270,000	Anglo-Argentine Trams, Nos. 260,008 to 510,007, and 560,008 to 580,007	5	..	8 %	8 %	8 %	8⅛— 8⅛	8⅜— 8.7/16	8½	8⅜	— 1/16	4 14 10
260,007	Do. 5½ % Cum. Prefs., 1 to 260,007 ..	5	5½%	5½%	5½%	5½%	5½— 6.7/16	5½— 6.5/16	6.7/16	5.15/16	..	4 8 11
266,600	Do. Permanent, 6 % Deb. Stock, 1888	100	6 %	6 %	6 %	6 %	131 —134	131 —134	..	..	..	4 9 7
285,100	Auckland E. Trams, 5 % 1st Mort. Deb. Stock ..	100	5 %	5 %	5 %	5 %	102 —105	102 —105	..	..	..	4 15 8
830,000	Babcock & Wilcox, 1 to 830,000..	1	17 %	20 %	20 %	20 %	3¾— 4	3¾— 4	78/9	76.6	..	5 0 0
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	6 %	1⅛— 1⅜	1⅛— 1⅜	..	..	..	3 13 10
38,000	British Aluminium, Ord., 2,001 to 40,000	5	..	7 %	7 %	7 %	4½— 5¼	4½— 5¼	95/-	..	..	6 13 4
40,000	Do. do. 7 % Cum. Pref.	5	Nil	7 %	7 %	7 %	5 — 5⅛	5 — 5⅛	5.1/16	..	..	6 7 3
20,000	Do. do. "A" 6 % Cum. Pref.	5	Nil	6 %	6 %	6 %	4½— 5¼	4½— 5¼	..	..	..	5 14 3
20,000	Do. do. 4 % Funding Certs.	5	..	4 %	4 %	4 %	3¾— 4¼	3¾— 4¼	..	..	..	4 14 1
958,000	Do. do. 5 % 1st Mort. Deb. Stock Red.	Stock	5 %	5 %	5 %	5 %	100 —103	100 —103	..	..	..	4 17 1
300,000	Do. do. 5½ % Loch Leven Debs. ..	100	..	..	..	5½%	96 — 99	96 — 99	..	..	..	5 11 1
400,000	British Columbia E. Rail Def. Ord. Stock	100	6 %	6 %	6 %	6 %	127 —132	127 —132	129½	129	..	4 10
800,000	Do. 5 % Pref. Ord. Stock	100	5 %	5 %	5 %	5 %	111 —115	111 —115	113⅜	..	..	4 6
300,000	Do. 5 % Cum. Perp. Pref. Stock	100	5 %	5 %	5 %	5 %	104 —107	104 —107	..	..	..	4 13
238,000	Do. 4½ % 1st Mort. Debs., 1 to 6,250	40	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 7 5
220,000	Do. 4½ % Vancouver Power Debs., 1 to 2,200	100	4½%	4½%	4½%	4½%	102 —104	102 —104	..	..	..	4 6 7
133,301	British Electric Traction	10	6 %	6 %	3 %	Nil	2⅛— 2⅜	2⅛— 2⅜	47/6	..	..	Nil
161,437	Do. do. 6 % Cum. Pref.	10	6 %	6 %	6 %	6 %	6½— 6¾	6½— 6¾	6⅞	6½	..	8 17 9
1,448,653	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	5 %	100 —103	100 —103	..	..	..	4 17 1
410,178	Do. do. 4½ % 2nd Deb. Stock Red.	100	..	4½%	4½%	4½%	78 — 81	78 — 81	..	..	..	5 11 1
100,000	British Insulated and Helsby Cables	5	8 %	8 %	8 %	10 %	6½— 7 xd	6¾— 7	6¾	..	..	7 2 10
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	5⅝— 6⅛	5⅝— 6⅛	..	..	..	4 18 0
500,000	Do. do. 4½ % 1st Mort. Deb. Red.. ..	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
212,000	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	4½%	4½%	4½%	4½%	85 — 89 xd	85 — 89	..	..	..	4 18 11
400,000	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 475,000	5	6 %	Nil	Nil	..	1 — 1½	1 — 1½	..	..	..	Nil
1,016,353	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	4 %	60 — 65	62 — 67	..	..	+2	5 19 5
50,000	†Browett, Lindley & Co., Ord.	£1	Nil	Nil	Nil	..	5/16— 7/16	5/16— 7/16	..	..	..	Nil
50,000	† Do. do. 6 % Cum. Pref.	£1	Nil	Nil	Nil	..	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
105,731	Brush Electrical Engineering, Ord., 1 to 105,731 ..	2	Nil	Nil	2½%	Nil	1/16— 2/16	1/16— 2/16	..	..	..	Nil
150,000	Do. do. Non-cum. 6 % Pref.	2	6 %	6 %	6 %	Nil	1/16— 1⅛	1/16— 1⅛	..	..	..	Nil
125,000‡	Do. do. 4½ % Perp. Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	83 — 86	83 — 86	..	..	..	5 4 8
125,000‡	Do. do. 4½ % Perp. 2nd Deb. Stock..	Stock	4½%	4½%	4½%	4½%	68 — 71	68 — 71	..	..	..	6 6 9
100,000	Buenos Ayres & Belgrano, 1 to 100,000	5	3 %	4 %	3 %	3 %	4⅛— 4⅜	4.7/16— 4½	90/6	90/-	+ 1/16	3 4 0
40,000	Do. do. "A" 6 % Cum. Pref., 1 to 40,000	5	6 %	6 %	6 %	6 %	4½— 5¼	4½— 5¼	..	..	..	5 14 3
27,500	Do. do. "B" do., 1 to 27,500	5	6 %	6 %	6 %	6 %	4½— 5¼	4½— 5¼	..	..	..	5 14 3
13,200	Do. do. 5 % Deb. Stock	100	5 %	5 %	5 %	5 %	105 —115	105 —115	..	..	..	4 6 11
190,000	Do. do. 5 % 2nd Deb. Stock	100	5 %	5 %	5 %	5 %	100 —103	100 —103	..	..	..	4 17 1
137,610	Calcutta Trams, 1 to 137,610	5	6 %	8 %	8 %	8 %	7⅛— 7⅜	7 — 7⅜	7⅜	7⅛	— ⅛	5 6 8
30,000	Do. 5 % Cum. Pref., Nos. 1 to 29,880..	5	..	..	5 %	5 %	5 — 5¼	5 — 5¼	5½	..	..	4 10 11
350,000	Do. 4½ % 1st Deb. Stock..	100	4½%	4½%	4½%	4½%	102 —106	102 —106	..	..	..	4 4 11
35,000	Callender's Cable Construction shares	5	12½%	12½%	15 %	15 %	9⅜— 10⅜	9⅜ — 10⅜	10⅜	..	..	7 0 0
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	5¼— 5⅜	5¼— 5⅜	..	..	..	4 6 11
300,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	105⅜—107⅛	105⅜—107⅛	..	..	..	4 8 4
491,222	Cape E Trams., 1 to 491,222	1	10 %	5 %	Nil	..	5/16— 7/16	5/16— 7/16	..	..	..	Nil
450,000	Castner-Kellner Alkali, 1 to 450,000	1	4 %	4 %	6 %	8 %	1⅛— 1.5/16	1⅛— 1.5/16	25/7½	25/3	..	6 1 11
224,988	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4½%	..	97 —102	97 —102	99	..	..	4 8 3
911,568	Central London Railway, Ord. Stock	Stock	4 %	4 %	4 %	4 %	67 — 69	68 — 65	67	63	—4	6 3 1
644,216	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	89 — 91	88 — 90	89	88½	—1	4 8 11
644,216	Do. do. Def. do.	Stock	4 %	4 %	4 %	4 %	51 — 53	47 — 50	49	48½	—3½	8 0 0
1,480,000	City and South London Railway	Stock	2⅝%	2½%	1½%	2½%	45 — 47	45 — 47	46½	45½	..	4 10 5
85,000	Crompton & Co., Nos. 1 to 85,000	8	2½%	2½%	2½%	5 %	1.15/16— 2.1/16	1⅞— 2	..	..	— 1/16	7 10 11
100,000‡	Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 to 11,000 of £50 Red.	..	5 %	5 %	5 %	5 %	96 — 99	96 — 99	..	..	..	5 1 0

* Unless otherwise stated, all shares are fully paid. † A period of nine months. ‡ From Manchester Share List.

(Continued on next page.)

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years.				Closing Quotations Sept. 17th.	Closing Quotations Sept. 24th.	Business done week ended Sept. 24th, 1907.		Rise + or Fall —	Present Yield per cent.
		*	1903.	1904.	1905.	1906.			Highest	Lowest.		£ s. d.
260,000	Dick, Kerr & Co., 1 to 260,000	1	..	10 %	10 %	10 %	1⅛ — 1⅛	1⅛ — 1⅛	..	..	..	6 3 1
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000	1	6 %	6 %	6 %	6 %	1 — 1¼	1 — 1¼	..	..	..	4 16 0
294,150	Do. do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
60,000	Dublin United Trams. (1896), 1 to 60,000	10	5½%	6 %	6%	6 %	13 — 14	13 — 14	..	..	..	4 5 9
59,997	Do. 6 % Pref. between 1 and 60,000	10	6 %	6 %	6 %	6 %	12⅞ — 13⅞	12⅞ — 13⅞	..	..	..	4 7 3
99,261	Edison & Swan Utd., "A" shs., £3 pd., 1 to 99,261	5	Nil	2½%	4½%	..	1⅛ — 1⅛	1⅛ — 1⅛	..	..	..	9 8 3
17,139	Do. "A" shares, 01—017,139	5	Nil	2½%	4½%	..	2¼ — 2⅜	2¼ — 2⅜	..	..	..	8 6 9
319,475	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	83 — 85	83 — 85	..	..	..	4 14 2
72,220	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	5 %	89 — 92	89 — 92	..	..	..	5 8 8
112,100	Electric Contruction, 1 to 112,100	2	4 %	Nil	Nil	Nil	⅜ — ⅝	⅜ — ⅝	..	..	..	Nil
31,390	Do. do. 7 % Cum. Pref., 1 to 31,390	2	7 %	7 %	7 %	Nil	1⅛ — 1⅜	½ — 1½	..	..	— ⅛	Nil
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	4 %	5 %	5 %	5 %	8 — 8½	8 — 8½	..	..	..	5 17 8
200,000	Do. do 4 % Mort Deb.	Stock	4 %	4 %	4 %	4 %	92 — 95	92 — 95	..	..	..	4 4 3
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	3 %	4 %	4 %	4 %	1¾ — 2 xd	1¾ — 1⅞	..	..	..	20 0 0
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	7 %	10½ — 10⅝	10½ — 10⅝	..	..	..	6 10 8
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	5 %	102 —103	102 —103	..	..	..	4 17 1
200,000	Henley's (W. T.), Telegraph Works, Ord.	5	15 %	15 %	15%	15 %	11½ — 12½ xd	11½ — 12½	..	..	..	6 2 5
200,000	Do. do. 4½ % Pref.	5	4½%	4½%	4½%	4½%	5 — 5⅛ xd	5 — 5⅛	..	..	..	3 17 3
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½%	4½%	4½%	4½%	105½—107½	105½—107½	..	..	..	4 3 9
50,000	India-Rubber, Gutta-percha & Telegraph Works	10	10%	5 %	10%	10 %	14 — 15	14½ — 15¼	15½	..	..	6 13 4
37,500	†Liverpool Overhead Railway, Ord.	10	1¾%	1½%	Nil	Nil	1⅞ — 2	1⅞ — 1⅞	..	..	— ⅛	Nil
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	5 %	7½ — 8	7½ — 8	..	..	..	5 14 11
600,070	London United Trams. (1901), 1 to 50,007	10	8 %	6 %	8 %	8 %	6½ — 7½	6¾ — 7½	..	..	..	4 0 0
399,930	Do. do. 60,008 to 100,000	10	8 %	6 %	8 %	8 %	6¾ — 7½	6¾ — 7½	..	..	..	4 0 0
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	5 %	5 %	7⅞ — 8⅛	7⅞ — 8⅛ xd	8 7/16	..	..	5 14 3
1,331,000	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	82 — 86	82 — 86	..	..	..	4 13 0
314,016	Metropolitan Electric Trams., Defd.	1	Nil	Nil	Nil	Nil	3/16 — 5/16	3/16 — 5/16	2/-	..	..	Nil
500,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	31/32 — 1 1/32	31/32 — 1 1/32	17/6	..	..	5 2 7
350,000	Do. do. 4½ % Deb. Stock Red.	100	..	4½%	4½%	4½%	94 — 97	94 — 97	..	..	..	4 10 11
30,000	Peebles (B.) & Co., 6 % Cum. Pref., 20,001 to 50,000	5	..	6 %	6 %	6 %	3¾ — 4	3¾ — 4	..	..	..	7 10 0
245,500	Potteries E. Tro.	1	5 %	5 %	4 %	4 %	1/16 — 1/8	1/16 — 1/8	..	..	— 1/16	8 0 0
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	¼ — ⅜	¼ — ⅜	..	..	..	6 13 4
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	95 — 98	95 — 98	..	..	..	4 11 10
37,350	Telegraph Construction and Maintenance	12	20 %	15 %	15 %	15 %	31 — 33	31 — 33	32	31½	..	5 9 1
150,000£	Do. 4 % Ded. Bds., 1 to 1,500 Red., 1909	100	4 %	4 %	4 %	4 %	99½—102½	99½—102½	..	..	..	3 18 1
599,200	Undergd. E. R., Lon., 5 % Profit Shar. S. Nts.	..	..	..	5 %	5 %	55 — 58	55 — 58	..	..	..	8 14 1
66,666	Willans & Robinson, 1 to 30,000 & 80,001 to 116,666	5	3 %	Nil	Nil	..	1¼ — 1⅜	1¼ — 1⅜	..	..	..	Nil
66,666	Do. 6 % C.P., 30,001 to 80,000 & 125,001 to 141,666	5	6 %	Nil	Nil	..	3¾ — 4¼	3¾ — 4¼	..	..	..	Nil
246,574	Do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	76 — 80	76 — 80	..	..	..	5 0 0

ELECTRICITY SUPPLY COMPANIES.

14,000	Bromley (Kent) E.L. & P., 1 to 14,000	5	5 %	5⅛%	5⅛%	5⅛%	4⅞ — 5⅛	4⅞ — 5⅛	..	..	..	5 4 9
70,000	Do. do. 4½ % 1st. deb. stock	100	4½%	4½%	4½%	4½%	98 —100	98 —100	..	..	..	4 10 0
29,798	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10 %	10 %	10 %	10%	7¾ — 8¼	7¾ — 8¼	..	..	..	6 1 3
10,202	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	7⅞ — 8¼	7⅞ — 8¼	..	..	..	4 4 10
336,876	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	99 —102	99 —102	..	..	..	3 18 5
80,000	Charing Cross and Strand Electricity Supply	5	8 %	8 %	5 %	5 %	3¾ — 4	3¾ — 4⅛	70/-	..	+ ⅛	6 1 3
80,000	Do. do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	4½%	3¾ — 4	3¾ — 3⅞	72/6	..	— ⅛	5 16 2
80,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½%	4½%	4½%	4½%	3⅞ — 3⅞	3⅞ — 3⅞	..	..	..	5 16 2
427,400	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	96 — 98	96 — 99	..	..	+ ½	4 0 10
49,436	Chelsea Electricity Supply, Ord.	5	5½%	6 %	6 %	4½%	3 — 4 xd	3¼ — 4¼	..	..	..	5 5 11
175,000£	Do. do. 4½ % Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	102 —105	102 —105	..	..	..	4 5 9
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	5 %	6 %	6 %	6 %	9 — 10	9 — 10	..	..	..	6 0 0
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	10¾ — 11¼	10¾ — 11¼	..	..	..	5 4 4
400,000£	Do. 5 % Db. Stk., Scrip. (iss. at 115) all pd.	..	5 %	5 %	5 %	5 %	122 —125	122 —125	123½	..	..	4 1 4
800,000	Do. 4½ % 2nd. Db. Stk., Prov. Crts., all pd.	100	4½%	4½%	4½%	4½%	97 —100	97 — 100	..	..	..	4 10 0
40,000	County of Durham Electrical Power, Ord.	5	4 %	£3 7 0	4 %	4 %	4½ — 5	4¾ — 5	..	..	..	4 0 0
50,000	Do. do. do. 5 % Pref.	5	5 %	5 %	5 %	5 %	4¾ — 5	4¾ — 5	..	..	..	5 0 0
40,000	County of London Electric Lighting, Ord. 1—40,000	10	4 %	4½ %	5 %	5 %	6½ — 7⅜	6½ — 7⅜	7⅛	7⅛	..	6 9 0
40,000	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	6 %	10 — 11	10 — 11	..	..	..	5 9 1
400,000£	Do. do. 4½ % Deb. Stock	..	4½%	4½%	4½%	4½%	106 —109	106 —109	..	..	..	4 2 7
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½%	4½%	4½%	4½%	94 — 97	96 — 99	99	..	+ 2	4 10 11
80,000	Edmundson's Electric Corporation, Ord. Shares	5	7 %	7 %	4 %	Nil	¾ — 1	½ — 1	..	..	..	11 0 0
80,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	3 %	1¾ — 2	1¾ — 2	..	..	..	7 10 0
350,000	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	4½%	76 — 81	76 — 81	..	..	..	5 11 1
10,000	Folkestone, 1 to 10,000	5	5½%	5½%	5½%	5½%	4⅞ — 5⅜	4⅞ — 5⅜	..	..	..	5 2 4
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	..	..	5 %	5 %	5 — 5⅛	5 — 5⅛	..	..	..	4 10 11
90,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	96 — 99	96 — 99	..	..	..	4 10 11
13,000	Hove, 1 to 13,000	5	8½%	8½%	9 %	9 %	6⅞ — 7⅛	6⅞ — 7⅛	..	..	..	6 4 2
21,000	Kensington and Knightsbridge Electric Ord.	5	12%	12 %	10 %	10 %	8¾ — 9⅛	8¾ — 9⅛	..	..	..	5 8 1
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	94 — 97	94 — 97	..	..	..	4 2 6
111,000	London Electric Supply Corporation, Limited, Ord.	3	Nil	3 %	4 %	4 %	1⅜ — 1⅝	1⅜ — 1⅝	..	..	..	6 8 0
70,000	Do. do. do. 6 % Pref.	5	6 %	6 %	6 %	6 %	4⅜ — 4⅝	4⅜ — 4⅝	..	..	..	6 8 1
374,395	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4 %	4 %	4 %	4 %	88 — 92	88 — 92	..	..	..	4 17 10
200,000	Metropolitan Electric Supply, 1 to 100,000	5	62½%	10 %	10 %	8 %	4⅜ — 5⅜	4⅜ — 5⅜	..	..	..	6 19 2
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½%	4½%	4½%	4½%	4½ — 5	4⅝ — 5⅛	98/1½	..	..	4 7 10
220,000£	Do. 4½ % 1st Mort. Deben. Stock	..	4½%	4½%	4½%	4½%	108 —107	108 —107	..	..	..	4 10 0
250,000£	Do. 3½ % Mort. Deben. Stock Redem.	Stock	3½%	3½%	3½%	3½%	87 — 92	87 — 92	..	..	..	3 16 1
250,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	95 — 98	95 — 98	..	..	..	4 11 10
67,991	Newcastle-on-Tyne	5	8 %	8 %	8 %	8 %	6⅛ — 6⅜	6⅛ — 6⅜	..	..	..	5 18 6
75,000	Do. 5 % Pref., 1 to 75,000	5	5 %	5 %	5 %	5 %	5 — 5⅛	5 — 5⅛	..	..	..	4 10 11
10,852	Notting Hill Electric Lighting	10	6 %	7 %	7⅛%	7⅛%	11 — 12	11 — 12	..	..	..	6 5 0
20,000	Oxford, 1 to 96 and 407 to 20,310	5	6½%	7 %	7 %	7 %	5⅝ — 6⅛ xd	5⅝ — 6	..	..	— ⅛	5 16 8
50,000	Do. 4 % Deb. Stock	100	4 %	4 %	4 %	4 %	95 — 97	95 — 97	..	..	..	4 2 6
40,000	St. James' and Pall Mall Electric Light, Ord.	5	14½%	14½%	12½%	10 %	7⅜ — 8⅛	7⅜ — 8⅛	..	..	..	5 17 8
20,000	Do. do. 7 % Pref. 20,081 to 40,080	5	7 %	7 %	7 %	7 %	6⅝ — 7⅜	6⅝ — 7⅜	..	..	..	4 14 11
150,000£	Do. do. 3½ % Deb. Stock Red.	100	3½%	3½%	3 %	3½%	86 — 91	86 — 91	..	..	..	3 16 11
12,000	Smithfield Markets Electric Supply, Ord.	5	4 %	4 %	4 %	Nil	⅜ — 1½	⅜ — 1½	..	..	..	Nil
50,600	Do. do. do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	71 — 75	71 — 75	..	..	..	6 0 0
65,000	South London Electricity Supply, Ord.	5	3 %	4 %	4 %	3 %	1⅞ — 2⅛	1⅞ — 2⅛	..	..	+ ⅛	6 6 4
120,000	South Met. Elec. Lt. & Power, Ord.	1	Nil	Nil	2½%	2½%	⅜ — ½	⅜ — ½	..	..	..	3 6 8
117,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	7 %	1 — 1⅛ xd	1 — 1⅛	..	..	..	5 12 0
200,000	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 7 5
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	5 %	1⅝ — 2⅛	1⅝ — 2⅛	..	..	..	11 2 0
50,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	2 — 3	2 — 3	..	..	..	8 6 8
200,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	..	4½%	4½%	4½%	94 — 97	94 — 97	..	..	..	4 12 9
110,000	Westminster Electric Supply, Ord.	5	13½%	14 %	13 %	12 %	8¾ — 9⅛	8¾ — 9⅛	..	..	..	6 6 4
81,279	Do. do. 4½ % Cum. Pref. (Original 5 %—Red. to 4½ % from 31st Dec., 1905)	5	5 %	5 %	5 %	4½%	5 — 5⅛	5 — 5⅛	5 1/16	..	..	4 1 10

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange.

Bank rate of Discount 4½ per cent., August 15th 1907.

EXPORTS AND IMPORTS OF ELECTRICAL GOODS DURING AUGUST, 1907.

The August returns of electrical business are probably the most satisfactory of the series of the present year.

With the exports for the month totalling some £189,779, a figure which has only once been exceeded during the past 30 months, home producers have every reason to be satisfied. The above amount compares with £168,275 recorded in the previous month's returns, and is some £55,000 in excess of the average of the twelve months in 1906.

As regards the imports, these amounted to £156,063 in value, as compared with £151,970 recorded in July, and are some £9,000 in excess of the 1906 average.

The re-exports at £18,583 remain practically stationary compared with the July returns, which it may be noted were also above the average.

As is usual, electrical machinery and cable exports figure prominently in the table, totalling some £78,000 and £57,000 respectively; these amounts compare with corresponding imports valued at £62,000 and £24,000.

Other prominent imports were electric lamps, £17,370; carbons, £12,733, and telephones, £21,000; and electric tramway materials figure in all three sections of the table.

The distribution of business amongst the various centres does not differ materially from previous months.

Registered Exports of British and Irish Electrical Goods from the United Kingdom.*

Country receiving exports and importing.	Electrical goods and appliances.	Electrical cable.	Electric lighting fittings and accessories.	Electric lamps.	Electric meters and instruments.	Electric machinery.	Batteries and accumulators.	Carbons.	Telegraph and telephone material, and electric bells.	Electrically-driven machinery	Tramways apparatus and materials.
	£	£	£	£	£	£	£	£	£	£	£
Russia, Sweden, Norway and Denmark	1,250	671	...	20	85	3,926	...	65	63	17	3,990
Germany	203	4,417	94	27	47	505	5	...	168	50	...
Netherlands	74	1,018	261	49	38	737	...	...	78	...	...
Java and Dutch Borneo	5	133	...	16	...	10	...	...	201	...	...
Belgium	269	1,053	364	37	230	1,112	5	...	304	...	...
France and French Indo-China	221	38	40	12	20	1,416	20	...	...	28	...
Portugal, Madeira and Portuguese Africa ...	36	61	76	49	10	1,083	3	...	222	47	...
Spain...	27	...	110	13	...	2 973	46	...	...	...	6
Italy and Austro-Hungary	77	...	32	36	181	3,912	...	...	185	...	...
Greece, Roumania and Turkey	24	29	33	...	12	267	4	...	...	...	...
Egypt and Tunis	232	614	207	...	20	362	6	...	157	...	...
China and Siam	218	909	1,455	684	39	11,821	168	8	197	714	...
Japan	627	6,223	237	...	444	3,456	4,005	47	18	810	...
U.S.A. and Cuba	120	...	145	3	51	1,179	49	47	...	...	...
Mexico, Colombia, and Venezuela	...	12	9	5	...	15	...	...	...	...	...
Peru and Uruguay	1,850	224	22	58	...	229	5	...	7	...	...
Chile	58	3,159	1,192	417	12	2,157	...	...	...	...	...
Brazil	410	486	586	184	33	5,663	613	48	...	...	...
Argentine	1,508	1,474	286	...	148	2,741	84	...	215	297	...
Channel Isles, Gibraltar and Malta ...	316	1,391	...	5	42	171	...	...	...	17	...
British West Africa	13	...	63	...	...	16	24	...	10	...	...
Cape of Good Hope	486	1,900	686	416	447	3,890	56	...	...	69	...
Natal...	813	1,084	276	587	599	435	78	22	185	990	...
Brit. East Africa, Mauritius and Aden... ...	517	20	516	2	23	503	9	...	44	...	...
India...	1,575	4,456	3,214	1,331	755	6,263	166	93	230	3,666	86
Burmah	367	1,187	292	125	559	225	28	...	15	...	...
Ceylon	45	19	161	23	...	...	219	...	88	...	...
Straits Settlements and Fed. Malay States ...	688	428	545	124	20	224	46	5	229	65	96
Hong Kong	187	598	628	405	...	6,719	34	26	68	66	...
West Australia	149	...	103	150	116	82	382	...	...	...	...
South Australia	396	...	85	...	...	445	31	...	...	...	...
Victoria	1,501	15,494	258	24	4	1,664	11	...	7	...	...
New South Wales	1,449	1,340	340	1,032	98	3,287	30	...	55	...	...
Queensland	...	...	73	22	...	80	23	...	...	...	...
Tasmania	12	...	...	...	100	40	...	...	...	...	...
New Zealand	285	6,191	503	272	172	2,946	8	...	178	434	...
Canada and Newfoundland	122	2,902	239	5	108	6	...	60	132	...	...
British West Indies and British Guiana ...	47	10	40	...	213	393	14	...	39	...	...
Total, £	16,177	57,541	13,171	6,135	4,626	70,953	6,212	421	3,095	7,270	4,178

Registered Imports into the United Kingdom of Electrical Goods from all Countries.

	£	£	£	£	£	£	£	£	£	£	£
Russia, Norway, Sweden and Denmark	74	194	...	44	...	2,117	81	36	8,083	...	...
Germany	450	9,472	2,203	5,311	175	16,798	1,081	4,543	1,512	396	...
Holland	72	4,974	2,237	9,129	406	9,392	574	3,895	487	...	...
Belgium	526	3,917	508	2,133	449	11,196	190	1,294	8,777	...	...
France	52	5,916	589	529	2,370	3,932	56	2,694	4,619	19	...
United States	4,323	7	1,234	224	102	13,807	65	271	1,523	4,786	110
Total, £	5,497	24,480	6,771	17,370	3,502	57,242	2,047	12,733	21,001	5,201	110

Additional imports: Italy, machinery, £104; New South Wales, goods, £5.

Registered Re-Exports of Foreign and Colonial Electrical Goods from the United Kingdom.

	£	£	£	£	£	£	£	£	£	£	£
Various countries, mainly as above	3,531	6,450	116	1,137	5	4,318	32	48	2,826	100	20

Total Exports: £189,779

Total Re-Exports: £18,583

Total Imports: £156,063

Note.—The amounts appearing under the several headings are classified according to the Customs returns. The first and third columns contain many amounts relating to "goods" otherwise unclassified, the latter, doubtless, consisting of similar materials to those appearing in adjacent columns.

* This section does not include telegraph cables and apparatus.

ELECTRIC COOKING.

Some interesting figures on electric cooking have been obtained by Mr. J. R. Cravath, the western editor of the *Electrical World*, who has used electricity for all the cooking, baking and ironing in his house since the beginning of this year. The data for May and June last are as follows:—

	May.	June.
Kilowatt-hours	106·6	103·6
Maximum demand KW. by Wright meter	2·8	3·0
Person-meals	364	385
Average persons per meal	3·9	4·3
KW.-hours per person per meal	·294	·268
Size of family	4-6	4-5

Recording ammeter readings were taken on 24 days during May, from which the averaged diagram shown in fig. 1 was prepared; this may be taken to represent fairly the daily cooking load on a feeder supplying 24 families, all of which have complete cooking outfits, in a large city such as Chicago, where the

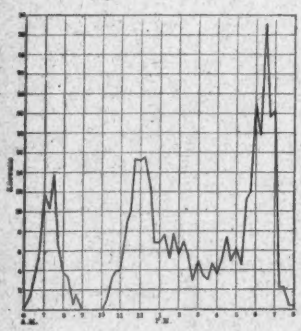


Fig. 1.

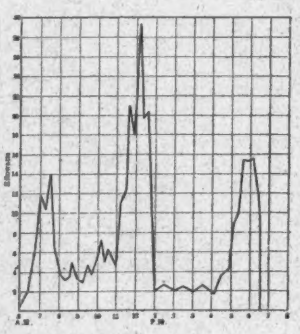


Fig. 2.

principal meal is in the evening. The maximum demand occurs between the town lighting peak and the residence lighting peak. In smaller towns, where the midday meal is the principal one, it is suggested that the curve would resemble fig. 2, which is based on the same data, but not on actual tests in such a town.

Mr. Cravath points out that while the maximum demand of a single customer is 3 KW., that of 24 combined is only 29·1, so that the demand per consumer would probably be only 1·2 KW., owing to the diversity of demand; moreover, in a small town, this is not added to the lighting maximum demand, and therefore should not be charged for on the lighting basis. In a large city, however, the cooking load would partly overlap the lighting peaks.

NEW PATENTS APPLIED FOR, 1907.

Compiled expressly for this journal by W. P. Thompson & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool, to whom all inquiries should be addressed.

8,178a. "Improvements in and relating to inductor alternators." J. L. Milton. (Date applied for under Rule 5 of the Patents Rules, 1905, April 8th, 1907.) September 13th. (Complete.)

20,068. "Improvements relating to electrical switches." J. W. Huntington. September 9th.

20,095. "Improvements in protective devices for alternating electric current circuits." K. Edgcumbe and E. I. Everett. September 9th.

20,096. "New or improved alarm device for electric tramcars." J. Stoker. September 9th.

20,110. "Improvements in switch and circuit-breakers for high potential circuits." J. N. Kelman. September 9th.

20,119. "Improvements in transmitters for wireless telegraphy." G. Marconi and Marconi's Wireless Telegraph Co., Ltd. September 9th.

20,128. "Improvements relating to electric connections for multiple wireless telegraphy." S. Eisenstein. September 9th. (Complete.)

20,159. "Improvements in telemotor systems." W. G. Gibbons. September 10th.

20,198. "Improvements in and relating to tramblers for induction coils." C. A. Vandervell. September 10th.

20,202. "Improvements in or relating to rotary converters." Siemens Bros. Dynamo Works, Ltd. (Siemens-Schuckertwerke G.m.b.H., Germany.) September 10th. (Complete.)

20,203. "Improvements in or relating to boosting arrangements for polyphase current systems." Siemens Bros. Dynamo Works, Ltd. (Siemens-Schuckertwerke G.m.b.H., Germany.) September 10th. (Complete.)

20,223. "Improvements relating to the manufacture of filaments for electric incandescent lamps." "Z" Electric Lamp Syndicate, Ltd. (Communicated from abroad.) September 10th.

20,226. "Improvements in and relating to electromagnetic devices." Allgemeine Elektricitats-Ges. (Date applied for under Patents Act, 1901, September 12th, 1906, being date of application in Germany.) September 10th. (Complete.)

20,227. "Improvements in and in the manufacture of refractory bodies." The British Thomson-Houston Co., Ltd. (General Electric Co., United States.) September 10th.

20,229. "Improvements in motor starters and regulating rheostats." Allgemeine Elektricitats-Ges. (Date applied for under Patents Act, 1901, September 12th, 1906, being date of application in Germany.) September 10th. (Complete.)

20,246. "Improvements in or relating to electric motors, dynamos and the like." R. Hacking, H. Hill and H. W. Hill. September 11th.

20,261. "Contact-breaker and placing of the condenser on a high-tension arc-light magneto ignition, used for motor-cars." A. Lutz. September 11th.

20,300. "Improvements in and relating to electric traction systems and apparatus therefor." Allgemeine Elektricitats Ges. (Date applied for under Patents Act, 1901, September 12th, 1906, being date of application in Germany.) September 11th. (Complete.)

20,895. "Improvements in or in connection with electrically-driven travelling pulley-blocks." S. H. Heywood. September 12th.

20,339. "Improvements relating to controllers and starting switches for electric motors." Veritys, Ltd., and A. E. Gott. September 12th.

20,341. "Improved wire connector for switchboards and the like." W. Multhauf. September 12th. (Complete.)

20,347. "Improvements in or relating to trembler induction coils." S. J. Watson and G. H. Smith. September 12th.

20,348. "Improved system or method of wiring multiple trembler induction coils." S. J. Watson and G. H. Smith. September 12th.

20,361. "Improvements in tremblers of induction coils." B. Brooks and F. H. Alston. September 12th.

20,362. "Improvements in or relating to electric accumulators." B. Brooks and F. H. Alston. September 12th.

20,372. "Improvements in the process of manufacturing metal filaments from colloidal metals." V. Scholz. September 12th. (Complete.)

20,380. "Improved electrical clock." F. Schneider. September 12th. (Complete.)

20,385. "Improvements in means for attaching rods, wires, or the like, to carbon commutator brushes and other blocks." The Morgan Crucible Co., Ltd., and C. D. McCourt. September 12th.

20,397. "Improvements in rheostatic electric controlling switches." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) September 12th.

20,398. "Improvements in and relating to coils for electrical use." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) September 12th.

20,399. "Improved liquid switch for the control of electric motors and other electric circuits." G. J. Philpott and G. H. Alderton. September 13th.

20,441. "Improvements in vapour electric apparatus." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) September 13th.

20,451. "Improved terminal connection for electric wires." C. M. A. Culverhouse and F. V. Culverhouse. September 13th.

20,460. "Improvements in or connected with vibrating electric contacts." J. A. Haslop. September 13th.

20,465. "Improvements in high voltage electric plugs with two pins and socket." R. Fitzgibbon. September 13th.

20,471. "Improvements in or in connection with apparatus for electrically lighting miners' safety lamps." J. C. Best. September 14th.

20,491. "Improved electrode for secondary batteries." E. Heymann. September 14th. (Complete.)

20,495. "Improved means for governing the speed of alternating current commutator machines." H. C. E. Jacoby. September 14th.

20,508. "Improvements in and relating to sparking coils for internal combustion engines." C. A. Vandevell. September 14th.

PUBLISHED SPECIFICATIONS.

Copies of any of these Specifications may be obtained of Messrs. W. P. Thompson & Co., 322, High Holborn, W.C., and at Liverpool price, post free, 9d. (in stamps).

1906.

Electric Incandescent Lamp. G. Wallace. 19,094. August 27th.

Electrical Resistance Device. J. Watkinson and A. E. Payne. 19,219a. August 28th. (Date applied for under Rule 5, Patents Rules 1905, August 28th, 1906.)

Electrolytic Resistance. J. C. Schäfer. 19,479. August 31st.

Electro-magnetic Variable Gear for Motor Cars, Motor Cycles, and the like. L. Mitchell. 19,756. September 5th.

Electro-magnetic Switch. R. M. Newbold. 20,043. September 8th.

Electric Alarm Devices for notifying Attempts at Breaking or Opening Locks. A. Bloch. 20,456. September 14th.

Insulating Studs and the Like, and Methods of Making the Same. British Thomson-Houston Co. (General Electric Co., United States.) 20,529. September 20th.

Application of the Electric Arc for Producing Reactions in a Gaseous Mass, and Apparatus Therefor. A. A. Naville, P. A. Guye and C. E. Guye. 21,388. September 26th.

Electric Arc Lamps. W. J. Davy. 23,550. October 23rd.

Means of Automatically Electrically Connecting and Mechanically Suspending an Arc Lamp or the Like, and Releasing same for Lowering. J. Stevenson and C. R. Williams. 23,800. October 26th.

Production of Radio-active Crystals. J. Reitz. 24,222. October 30th.

Production of Boron. British Thomson-Houston Co. (General Electric Co., United States.) 25,978. November 16th.

Wireless Telegraphy and Telephony. V. Poulsen. 28,602. December 14th. (Date applied for under International Convention, December 15th, 1905.)

Electric Torch as used for Surgical and Dental Operations. F. A. Larard and E. L. Dearden. 29,244. December 22nd.

1907.

A Balanced Electro-mechanical Tractor Equipment Alternately or Simultaneously Receiving or Generating its Driving Power. A. Feron. 1,482. January 19th. (Date applied for under International Convention, January 20th, 1906.)

Electrical Resistance Computing Scale. C. G. G. Thomas. 2,528. January 29th.

Telegraphony. G. Morin. 3,599. February 13th.

Electric Cables containing Induction Coils. Siemens Bros. & Co. and W. Dieselhorst. 5,547. March 7th.

Process of Electrically reducing Oxide Ores and the like. A. Petersen. 5,655. March 8th.

Incandescent Electric Lamps. E. Foreman. 6,199. March 14th.

Method for the Manufacture of Tungsten Filaments for Electric Lighting and Heating by the Reduction of Tungstic Acid. Allgemeine Elektricitäts-Ges. 7,407. March 27th. (Date applied for under International Convention, March 30th, 1906.)

Devices for Directing the Arcs of Electric Arc Lamps. Deutsche Beck-Bogenlampen Ges. 9,499. April 23rd. (Date applied for under International Convention, December 21st, 1906.)

Thermo-dynamic Engines. J. E. Haennig. 9,557. April 24th. (Date applied for under International Convention, April 28th, 1906.)

Electric Arc Illuminating Apparatus, more Particularly for Use in Photography. J. Schmidt. 9,574. April 24th.

Receivers for Electro-Magnetic Waves. A. Artom. 13,262. June 17th. (Date applied for under International Convention, January 10th, 1907.)